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ON FLAT-FOOT, AND ITS CURE BY OPERATION.

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THE improved results of wound treatment by Sir Joseph Lister's antiseptic method have placed in our hands modes of remedying surgical deformities that would formerly have been regarded as unjustifiable, but may now be practised with absolute confidence by skilled antisepticians, and with excellent results even by those less versed in the antiseptic methods.

The operations of osteotomy, though known and practised by a few before Listerism was introduced, have now become the property of every surgeon and are almost universally practised. But much remains to be done before we shall have turned our improved methods of wound treatment to the best possible account in the surgery of bones and joints.

In one part of this field I have been working for several years, and now venture to bring my results before

my surgical brethren. The cure of flat-foot is the object I have aimed at.

Excepting those by apparatus, the modes of treating this disease at present employed are, so far as my experience goes, entirely unsatisfactory, and no instance of cure by any of them has come under my observation. It is true that by rest and time the pain that accompanies the deformity becomes ameliorated or disappears, so that the surgeon may, if he pleases, call the result a cure; but the deformity does not disappear or even become materially diminished. A cure, in the proper sense of the word, has not taken place. In all the cases where I have employed the ordinary methods long and patiently there has resulted in the most favourable merely a cessation of the pain at the instep, but in the large majority the patients have wearied of treatment and withdrawn themselves from it. Want of time and money have hitherto prevented such patients carrying out a cure by orthopædic machines under my care.

Flat-foot, or pes valgus acquisitus, is, like scoliosis and knock-knee, almost invariably the result of a disproportion between the strength of the foot and the work it has to accomplish. Hence it generally occurs in adolescents, is most frequently due to the rachitis adolescentium that produces so many of these static deformities, and is seldom found save in those who are overworked. In message boys, young agricultural labourers, domestic servants, and even young people at school, we frequently see it slowly appear. If we examine into their general health we rarely miss the languid circulation, the cold extremities prone to perspire, and the ricketty knottings of the bones, especially at the anterior ends of the ribs. We are told that there has been heavy labour, out of

proportion to the strength, causing pain or dull aching about the instep, which passes off on rest but reappears on exertion, and becomes more aggravated the longer the exertion is continued.

But the history of flat-foot varies much. I know of one case where a very marked double flat-foot occurred, without any pain being complained of, in a boy of seven years of age, who was very fat, and in whom the weight of the large body seemed the only cause adequate to account for the onset of the deformity.

In flat-foot, as in all static deformities, it seems reasonable to believe that all the textures which normally contribute to maintain the correct posture of the foot become affected, though of course in different degrees, and the foot, as a consequence, becomes perverted in its form.

The alterations are worthy of some notice. The point on which they hinge is a yielding and flattening of the arch of the instep, all other changes being secondary to this and directly consequent on it. The flattening of the arch of the foot is the test of the existence of flat-foot, and the condition is better designated by the term flat-foot, or pes planus, not unfrequently bestowed upon it, than by the name of pes valgus, or everted foot, that it oftener bears. The name pes valgus is misleading. The valgus or everted posture is not necessarily characteristic, as it includes another and different condition which is, I think, generally confounded with it. This condition is that of everted or valgus ankle.

Valgus ankle is usually seen in young girls passing out of childhood, and is sometimes temporary, sometimes permanent. The ankle, especially when seen from behind, is observed to have lost its straight form and to fall inwards, so that the malleoli approach the middle line

and constitute a "knock-ankle." The rubbed condition of the boot may show that the ankles do actually strike one another in walking. If the foot be inspected without its coverings, the valgus ankle, which may be detectable only when the patient stands, is observed to be limited to the region of the ankle-joint, and seems due to a loss of form of the bones, the malleoli and astragalus, perhaps the calcaneo-astragaloid articulation as well. But the foot below the ankle does not participate in the deformity, save in so far as the valgus ankle entails on it an outward deviation. The arch of the instep remains unaltered (Fig. 1).

In true flat-foot, on the contrary, the ankle-joint can hardly be said to participate. The arch of the foot suffers, and the bones, tendons and ligaments that maintain the shape of the instep are so modified that the arch unfolds, its two extremities recede from one another, and its curve finally becomes a straight line, touching the ground along its whole length.

Examination of such a foot may reveal a slight laxity of all its articulations; but there are always great changes at the joint between the scaphoid and the head of the astragalus, forming the inner half of the medio-tarsal or Chopart's articulation. Here the relaxation is very great, so that by acting on this joint alone we can on the one hand rectify the faulty position of the foot, and on the other hand move it into the worst possible degree of the deformity.

It is only when the disease is still recent that we can by manipulation cause the deformity to disappear. In recent cases it may even disappear if the patient sit down and lift up the foot for our inspection. The superincumbent weight being removed, the flattening of the arch

disappears, sometimes quickly, sometimes more slowly, so that the foot may be normal in outline, and our attention be called to what really exists only by the patient complaining of a dull aching pain at the instep, sometimes aggravated by firm pressure about the scaphoid bone. In such instances mistakes in diagnosis are frequent. When the patient stands, however, the deformity appears, and if he again sit down and lift up the foot it resumes once more its normal outline.

When we try manually to enlarge the arch which the instep forms, the deformity can be made as evident as when the patient stands, and we can remedy in like fashion the distortion we have produced. When the foot is so manipulated it is only needful to move Chopart's joint, one hand fixing the astragalus and the other grasping the scaphoid. Then the maximum degree of the disease can be caused to appear or disappear, while similar movement at any other joint shows that its share in producing the deformity is very slight. So long as the hands maintain Chopart's joint in its proper position, the flat-foot cannot be rendered evident.

In process of time the deformity becomes permanent, and can no longer be made to disappear. It is in such cases that the details of the deformity can best be studied. We discover that the tarsal bones along the inner side of the foot are ranged in a line parallel with the ground and everywhere in contact with it. The first metatarsal and the internal cuneiform are horizontal in direction; the scaphoid and head of the astragalus behind them form a marked prominence on the sole and inner side of the foot, a callosity covering them on the sole and a bunion-like patch of skin on the inner side of the foot. The articulation between them, so mobile in the earlier stage, is now

fixed and rigid. On the application of great force it can sometimes be caused to yield, so that Chopart's joint may be restored to position, the deformity disappearing, but often the joint remains rigid and refuses to move upwards under any force. This is due to an alteration in the shape of the bones, detectable by palpation and also visible when the joint is opened.

The manner of production of this alteration is as follows. When the arch is flattened the ligaments beneath become elongated, and on the under surface of the joint the bones tend to become separated from one another, while on the upper side the pressure between them is increased. Hence growth is checked, or absorption even takes place, at the upper halves of the articulations of the scaphoid and astragalus, while the lower halves, where the mutual pressure is lessened, show a tendency to separation and increased growth of the separated surfaces. The increased growth takes place mainly in the astragalus, so that the joint is not found gaping below, but the caput tali is changed in shape, becomes somewhat square in form, and presents an abnormal ridge, or projecting angle, dividing its articular facet into two portions, one articulating with the scaphoid, the other with the inferior calcaneo-scaphoid ligament. When this disposition of bone becomes very prominent the flat-foot enters on its permanent stage, and the more marked the projecting angle becomes, the greater is the resistance offered to the reduction of the deformity. The angle ultimately projects so much that it locks on the scaphoid, and no reduction is possible until it be removed.

The relaxation and subsequent alteration of shape in the bones of Chopart's joint are the key to the disease and its successful operative treatment.

There are two secondary changes in the foot, however, that deserve notice as completing the picture of flat-foot —first, the everted or valgus position, and second, the attitude of the great toe. It naturally follows that, after the descent of the arch on the inner side of the instep, the changed relations of the tarsal bones produce an appearance of the foot resting unnaturally on its inner edge, or in other words, becoming everted. In most cases of flat-foot this phenomenon is very apparent. It seems due to the falling down of the inner arch, and is generally unconnected with valgus ankle. When the arch is raised into its proper place the eversion vanishes.

By the increased separation of the extremities of the arch the structures of the sole of the foot are made tense, and the muscles that flex the great toe, being put on the strain, and even atrophied by the pressure against the ground, flex the great toe at its ball, and it consequently ceases to form an angle with the metatarsus, and comes to be in a straight line with it. In this way the metatarso-phalangeal joint appears very prominent above, and from its abnormal exposure to pressure is tender or forms a bunion, while the ball of the great toe, a feature of the normal sole, is diminished in size. The position of the toe is at first remediable, and a restoration of the arch of the instep produced at Chopart's joint by the hand remedies at the same time, without anything further being done, the malposition of the toe, but it reappears in proportion with the reappearance of the flattened arch. In long-standing cases the toe becomes permanently deformed, and may ultimately give rise to much suffering.

In the very worst cases, which are rare, the yielding of the foot at Chopart's joint goes even further than to

allow the head of the astragalus to touch the ground. The sole divides into two parts, that before and that behind Chopart's joint, and each obeys a different tendency. The part anterior to the joint remains as the walking sole of the foot and continues in contact with the ground, while the other portion, consisting of the os calcis and astragalus, has its posterior end drawn up so that the tuberosity of the calcaneum is elevated, a finger's breadth or thereby, from the ground, and the portion of the sole corresponding with the posterior fourth of the foot does not come into contact with the ground. The bones are rigidly fixed in this perverse posture, and the feet are shaped, not like arches, but like canoes (Fig. 2).

The difference between a flat-foot where the deformity is still reducible and one where it has become rigid depends upon a change of form of the bones, already partly described, that can to some degree be observed by palpation from without, but which is very evident when the joint is opened.

In the extreme dorsal flexion of the astragalo-scaphoid joint present in flat-foot, the caput tali is no longer so much covered below by the scaphoid as it normally is, but escapes from it downwards and inwards, so that it finally forms on the inner side of the sole a prominence greatly exceeding in size that of the tuberosity of the scaphoid. The articular surface of the scaphoid is altered in direction, so that it looks more downwards, and tends to forsake its contact with the caput tali. There would be an actual gap between the bones (Fig. 3) below did not the astragalus accommodate itself to the void and assume an angular form with two facets nearly at right angles to each other, one looking forwards and articulating with

the scaphoid, and the other looking downwards to the ground, parallel to it and resting on the inferior calcaneo-scaphoid ligament (Fig. 4).

So soon as the altered shape of the astragalus head becomes pronounced the deformity ceases to be easily reducible, and it shortly comes to pass that it offers an insuperable obstacle to the reduction; the foot is henceforth fixed, because the prominent angle cannot be made to ascend behind the scaphoid, since it locks upon it with every attempt at plantar flexion.

I have given much attention to these cases and have tried many plans of treatment. Boots with the inner margins of the soles raised, arched steel supports under the inner side of the sole, well moulded pads of cork and other materials, or hollow cushions of caoutchouc, have not produced a cure even in mild cases, while they are of course inapplicable in the severer forms. Lateral supports to counteract the valgus position have been equally unsuccessful. Prolonged rest, with or without stiff bandages, has always relieved the pain for the time being, but has never cured a single case in my hands. Neither have I had any success with Langenbeck's method of forcibly reducing the deformity with the hands, and then treating in plaster of Paris bandages, for it is inapplicable in the reducible cases and impossible in the more advanced forms. To give the experience of a good many years in one sentence—none of the plans of treatment I have tried have had in my hands any effect whatever in the cure of the disease.

When observing the disease and my failures in its treatment, I could not help being struck with the prominent part played in its production by Chopart's joint, and became convinced that, could any method be

devised of restoring the joint to its normal position and rigidity, or even of causing bony ankylosis there, it would almost surely result in a cure. From observing that so long as the manipulating hand held Chopart's joint firmly reduced, so long the deformity was apparently cured, the inference was natural that any method of imitating from within the effect of this support from without would have a good prospect of radically curing the disease. Ankylosis between the astragalus and the scaphoid could do no great harm, for there are so many other points at which the tarsus is movable that probably the rigidity of this one joint would entail no inconvenience.

The first attempts at reducing this idea to practice were made in the year 1877, when a series of cases of flat-foot were treated by reducing the deformity as perfectly as possible, fixing them in the improved position by plaster of Paris bandages and maintaining them immovable for periods of three months. Some of them had a fenestra cut in the bandage and frequent injections of carbolic acid lotion made into the neighbourhood of the joint in the hope of causing rigidity by the prolonged rest and the irritation of the injections. Although some seemed to have benefited by the treatment the improvement was not permanent, and in none was a satisfactory cure obtained.

It was next decided to open the joint and remove the articular cartilage from a small portion of either bone at corresponding points, under the idea that ankylosis would result from it. Bidder's experiments, performed in 1877,* had shown that new bone is not formed when an ivory peg is driven through the articular surface of a bone, and hence it was inferred that nailing the bones together by pegs, without removal of the articular cartilage, would

* *Langenbeck's Archiv.*, vol. xxii., heft i. *Regeneration des Knockengewebes.*

fail in producing ankylosis, while removal of a portion of the articular cartilage would probably result in bony union of the denuded parts.

Accordingly in the next case that was submitted to treatment an incision was made along the inner side of the foot over the joint, and while the foot was held in the best possible position a notch was made by a small saw in the two bones, the saw being made to cut a linear track into the head of the astragalus and through the joint for some distance into the scaphoid (Fig. 5). It was hoped that bony union between the two clefts would result, and to favour this the foot, still held in the rectified position, was put up in plaster of Paris. After three months' rest this patient was dismissed much improved, although I am unable to state that her cure was permanent, as careful inquiry failed to trace her after she had left. Before she left I believed I could make out slight movement at Chopart's joint, and as this would have jeopardized the cure it was decided to treat the next cases by more extensive denudation.

In the year 1878 two patients were subjected to the following operation. An incision was made along the inner border of the foot down to the joint, and a small wedge of bone, three-quarters of an inch deep and of a like breadth, was chiselled out of each of the bones, leaving notches at points corresponding with each other, the foot being held in the position of most complete rectification while this was being done. In both cases the patients were dismissed in two months seemingly cured: in one of them the cure was permanent a year after the operation, in the second case the result was not satisfactory, as she was still complaining nearly two years after the operation.

Yet it seemed probable that a more certain means of producing bony ankylosis would yield better results, and, after much consideration, the following method was devised and has since been carried out with excellent results in seventeen cases.

The object of the proceeding is to denude as much of the cartilaginous surfaces of the astragalo-scaphoid joint as can conveniently be reached, to place the foot in proper position and secure its immobility by uniting the two bones by ivory pegs. It is applicable both to the milder cases which are reducible, and the severer, which are not so. I have never had an opportunity of using it in the very aggravated forms where the sole becomes boat-shaped and the heel leaves the ground.

On purpose to secure the utmost benefits of the antiseptic method, the feet are, as a preliminary step, washed daily in a 1.20 carbolic lotion and done up in a large Lister's dressing, while the patient is confined to bed, and this is carried out for four or five days, so as to secure the greatest possible purity of the thick layers of epidermis that exist on the sole and over Chopart's joint. All loose epidermis is peeled or rubbed off with pumice-stone, and when a state of purity has been reached the patient is put under chloroform or ether, both feet, if the disease be double, being operated on at one sitting.

The dressings are removed, the elastic tourniquet is placed round the leg below the knee, and the leg, ankle, and foot are washed once more with carbolic lotion and finally with oil of turpentine. The foot is then laid upon a disinfected piece of macintosh and the carbolic spray is turned on it. It is convenient to stand on the left side of the patient, while an assistant stands opposite, holding the foot by the ankle and metatarsus.

In a normal foot Chopart's joint lies about an inch in front of the internal malleolus, and the most prominent bony point on the inner side of the foot is the scaphoid tuberosity just anterior to it. But in the flat-footed the astragalus head is so greatly displaced from the scaphoid and so prominent that it forms the large projection seen and felt on the inner side of the foot about an inch in front of the tibia, and the scaphoid is comparatively indistinct, while the line of Chopart's joint is half an inch further from the tibia than usual. By moving the metatarsus this can generally be felt to be the case. Hence an incision, to open the joint, has to be made further from the ankle than in a normal foot.

The foot, lying in the assistant's grasp without any attempt being made to reduce the deformity, is placed with its outer side resting on the operation table, and an incision, an inch and a quarter long and parallel to the sole, is made along its inner side over the joint, dividing all the structures down to the bones. If this incision commence about an inch from the tibia its centre will be over the articulation. No important structure is divided save some small branches of the internal saphena vein or the small vein itself, and these may be tied with catgut or left unligatured.* If the incision be carried down to the bones by the first movement of the knife the head of the astragalus, partly covered with cartilage, will be observed through a button hole in the capsular ligament in

* A longitudinal incision gives best access to the joint: it may, in aggravated cases, advantageously be slightly curved with its convexity downwards, if it seem desirable. An incision across the border of the foot, parallel to the line of articulation, is attended with more risk of missing the joint and wounding important structures, while it gives less ready access to the head of the astragalus than the incision parallel to the sole.

the depth of the wound if its edges be retracted by aneurism needles. If not, a second cut with the knife completes the division of the soft parts. After the caput tali has become visible free access to the joint has to be obtained by separating the attachments of the ligamentous capsule to the edge of the scaphoid for a distance of half an inch on each side of the wound. The ligament is seized by a dissection forceps, elevated, and detached from its insertion into the scaphoid, its connections with the periosteum and fibrous structures over the scaphoid being maintained as far as possible by cutting with the edge of the scalpel directed towards the toes, the blade lying parallel with the bone.

In this manner a somewhat T-shaped opening is made into the joint, and sufficient access is gained for the next step of the operation—the denudation of the bones. A stout chisel, half an inch broad, bevelled on one side and provided with a wooden handle, is held in the right hand with the bevelled side away from the caput tali, while by its means the articular cartilage is shaved away from the whole of the exposed surface of the bone over as great an extent as possible, a thin layer of the subcartilaginous bone being also removed, so that the cancellous structure is well laid bare. The chisel is next applied to the scaphoid, the bevelled side being held towards it, as the surface to be here denuded is concave, and by repeated shavings the denudation is carried as far as possible between the bones. In this manner each bone is bared of its cartilage, and if the arch be now restored to its normal position by the assistant the two surfaces are found to correspond, the head of the astragalus retreating into its normal position behind the scaphoid.

If the deformity be of old standing and the bones

have adapted themselves to their altered position, it is not possible to restore the arch until, by means of the chisel, the prominent angle that has formed on the lower surface of the astragalus head has been shaved off and the rounded form of the head restored: but when this is accomplished the arch is easily put into its proper shape.*

The next step of the operation is to nail the bones together by ivory pegs. The joint is washed out with 1.20 carbolic lotion, and the arch of the foot is restored to its normal shape by the assistant depressing the metatarsus. The scaphoid after this movement covers the head of the astragalus and the denuded surfaces lie opposite one another, separated by an interval of about a quarter of an inch, caused by the removal of so much bone. In the milder cases the arch is perfectly restored to its position, even in the severer cases it is much improved. In its restored shape it is held fast by the assistant, while the operator drills two holes through the scaphoid into the caput tali. The anterior angle of the wound is drawn apart by retractors so as to expose the scaphoid. The point of the drill† is placed on the upper and inner side of the scaphoid, the drill is pointed towards the centre of the caput tali, and when its direction has been well determined it is set in motion, piercing a

* The denudation can be accomplished by means of a stout scalpel, a Volkmann's sharp spoon or curette, or a mallet and chisel, but the most convenient plan has seemed to me that which I have described, by the chisel held in the hand. The soft bones are easily denuded, and the shavings are carefully lifted out by a dissection forceps. A little gluey synovia often escapes during the process.

† The best drill, to my thinking, is an Archimedean drill, such as is used by carpenters, fitted with what are sold as "broaches" (No. 40) by the wholesale watchmakers, and which form good drill points. They should be somewhat less in size than the ivory pegs to be employed. The drills cost 3/-, the broaches 3½d. each.

hole an inch and a quarter in depth through the two bones. On withdrawing the drill* an ivory peg† is held ready to be put into its place. When it is withdrawn one of the pegs is placed in the hole and driven home by a series of light taps with a small mallet. After it has entered for rather more than half its length its projecting end is cut off level with the scaphoid by a bone forceps. A second perforation is then made parallel to the first and nearly half an inch distant from it through both bones, and a second peg is driven home in it. One of the perforations may be made beneath one margin of the skin and the other beneath the opposite margin (Fig. 6).

The bones are so firmly fixed together by the pegs, which can be seen crossing the gap that separates them, that when the assistant removes his hand, the foot remains in the improved position.

The wound is well cleaned, its lips brought together by a series of catgut sutures an eighth of an inch apart. I do not usually loosen the elastic tourniquet until after this has been done and the Lister's dressings applied, but if there be any dread of hæmorrhage the elastic cord can be removed before the wound is closed. If this be done the bleeding is usually free, and comes from the bones.

* The best method of disinfecting the drill and its point is, I believe, to wash it well with oil of turpentine.

† The pegs are prepared from the finest ivory knitting needles, sold in the Berlin wool shops as ivory knitting pins, No. 13, Wynn's bell gauge, and are about eight inches long and of the size of a No. 7 or 8 catheter, French scale, or a No. 2 English scale, They should be cut with a fine saw into pieces three inches in length, which are sharpened at one end by a file, and boiled in 1.20 carbolic water for ten or fifteen minutes until they lose their whiteness and become impregnated with the disinfectant lotion-after which they are preserved in 1.8 carbolic oil. Or they may be prepared by Neuber's method of prolonged soaking in German oil of juniper and afterwards preserved in absolute alcohol. I have not yet used them as prepared by the latter method.

But as no arteries of any magnitude have been divided the compression of a well applied dressing is the best means of preventing the escape of any quantity of blood. A Lister's dressing is therefore carefully put on, enclosing the whole foot from a hand's breadth above the ankle to beyond the toes. The spray is then turned off. A few turns of plaster of Paris bandage outside the dressing steady the foot, and after they have been applied the tourniquet is removed.

The patient suffers sharp pain for four and twenty hours, and after that the convalescence is painless. The dressings may be removed on the fourth day, or left on for weeks. On their removal the wound has always been found healed, or existing merely as a superficial sore. The patients are kept in bed for two or three months, and are then permitted to rise. In a week or two afterwards they are able to walk freely.

This operation I have performed seventeen times in ten patients, and in one case, operated on the 8th December last, I pegged on the left foot the joint between the scaphoid and internal cuneiform as well as Chopart's joint, because its movement seemed unusually free.

My patients have all, without exception, remained free from fever, the thermometer not rising above 100° Fh., save when two of them, while still under treatment, were attacked by sore throat, lasting for a day or two. The wounds remained aseptic, and the dressings were renewed only a very few times. In some of the patients a slight tenderness and pain on trying to walk at the end of six or eight weeks indicated that the joint was still unankylosed, doubtless from the slow repair due to defective circulation. They were often permitted to walk a little

at the end of two months, and to use the feet freely at the end of three months, but I think that any use of the feet should as a rule not be permitted until three months have elapsed, as bony union is slow in such individuals.

In all my patients, to the best of my belief, great benefit resulted from the operation, and in most of them bony ankylosis and a painless arch was obtained. They mostly resumed their laborious occupations, and were able fully to bear all the demands made upon them. One patient subsequently died of heart disease.

In one patient an ivory peg was spontaneously and painlessly extruded by a small cutaneous opening five months after the operation; but in every other instance they remained, probably to undergo slow absorption or vascularisation.*

Another patient, while under treatment, complained that one of his operated feet ached a little, and was never quite satisfied with the result on that foot. Yet he underwent a season of heavy harvest work after leaving the Infirmary. He returned again last November, and a little fulness was then detected about the calcaneo-cuboid joint of the right foot, the one which had ached. Both were put up in plaster of paris for two months, and when these were removed at the beginning of this month the feet looked perfect. The restoration of the arch of the instep was absolutely perfect in this case.

In a few of the other patients the plantar arch was restored to perfection. But this was not generally the case. In all it was, however, much improved, and added to the patients' lightness of step even when, to a surgical eye, traces of the deformity remained.

* *Riedinger. Verhanp. d. Deutschen Gesell. f. Chir.*, 1881, x. Cong., p. 167; *Trendelenburg*, the same, 136.

Fig. 1.
Valgus Ankle.

Fig. 2.
Extreme flat Foot.

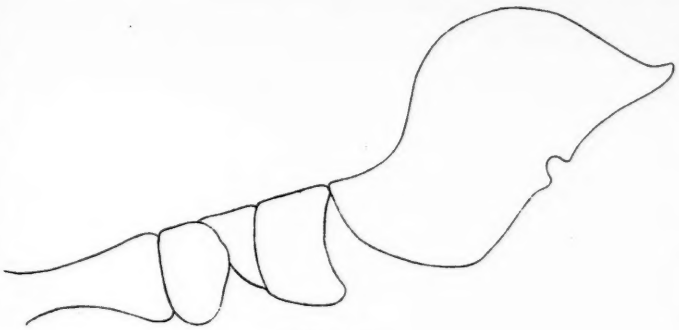

Fig. 3.

Diagram of the tendency to separation of the Bones in flat Foot

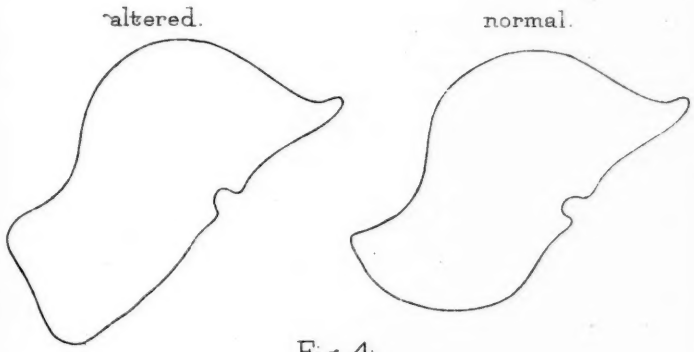

Fig. 4.

Diagram representing the sort of alteration that occurs in the shape of the Caput Tali. It is not possible to represent the change diagrammatically, as the Caput Tali slips from behind the Scaphoid downwards and inwards, not merely downwards as shewn in Fig. 3.

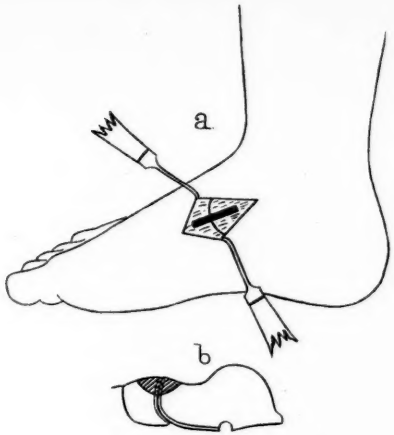

Fig. 5.

An early attempt at cure by Operation.

a. Line of saw incision.

b. Depth of saw incision

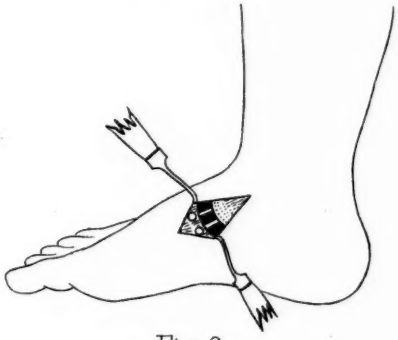

Fig. 6.

Sketch of the Operation by pegging Chopart's Joint.

One of my cases is still under treatment.

Knowing how much the prolonged rest following the operation would of itself tend to improve such cases, and alive to the temptation to be sanguine and over confident in judging of the results of one's own work, I have endeavoured to free myself from any bias, and to form a true estimate of what was due to the operation itself in the improvement that resulted. Such of the patients as were accessible were seen or written to at considerable periods after the operation, and were warned that the information they gave was required not to gratify me, but to determine whether the same operation should be tried upon others. They all, save the patient mentioned above, maintained that the operation had cured them, and that they would willingly undergo it again on account of the benefit they had derived from it.

My own impression is that this method of treatment is likely to be of use in suitable cases, uncomplicated by other diseases, and where none of our other methods can be relied upon. I therefore think it desirable that it should be tested by others, should they deem it worthy of a trial, and receive its verdict according to the results it may yield in their hands.

TABLE OF CASES OF FLAT-FOOT OPERATED BY EXCISION AND PEGGING OF THE ASTRAGALO-SCAPHOID ARTICULATION.

No.	Sex.	Age.	Occupation.	Right or Left Foot.	Date of Operation.	Course of Cure.	Date of Dismissal.	Final Result.
1	F	18	Farm Servant... ...	Right and Left	4th Jan., 1880	Recovery afebrile save for intercurrent sore throat	5th June, 1880	Apparently cured at dismissal. Writes on 10th Dec., 1883, that she is "quite well, much better of the operation," her feet "stronger than they were before."
2	F	14	Domestic Servant...	Right	30th Sept., 1880	Afebrile recovery ...	22nd Nov., 1880	Sent to Convalescent Hospital, and subsequently dismissed cured. On 1st April, 1881, returned to report herself. Had been in service for a month and was nearly well. On 8th Sept., 1881, she returned to report and was seen by Mr. Wm. Adams, London. Quite cured.
3	F	17	Farm Servant... ...	Right and Left	30th Sept., 1880	Afebrile recovery ...	?	Returned to report herself on 29th Sept., 1881. Feet almost perfect in shape, valgus position gone. Is satisfied she is cured.
4	F	13	Mill Worker	Right and Left	5th Mar., 1881	On 24th May, 1881, pain on walking. Again kept at rest	7th July, 1881	Apparently cured at dismissal. She died, I was afterwards informed, of heart disease and general dropsy in June, 1882.
5	F	15	Crofter's Daughter	Left	25th Jan., 1882	Afebrile recovery ...	11th Mar., 1882	Apparently cured at dismissal. Writes on the 8th Dec., 1883, that the operation improved her foot very much, though it is "weak at times yet."
6	F	17	Domestic Servant...	Left	25th Jan., 1882	Afebrile recovery ...	13th Mar., 1882	Returned to report herself 9th Oct., 1882. Chopart's joint seems ankylosed at inner side. Patient is satisfied she is cured.
7	M	18	Farm Servant... ...	Right and Left	30th Dec., 1882	Afebrile recovery ...	?	Complained of a little pain in right foot on dismissal. Supposed to be malingering. Worked through harvest of 1883 and returned on 1st Nov., 1883. Outer part of right Chopart's joint a little swelled. Left foot perfect. Put up in plaster bandages until 5th Jan., 1884. The feet were then in perfect shape and seemed soundly cured.
8	F	18	Domestic Servant...	Right and Left	1st Mar., 1883	Afebrile recovery ...	?	Returned 22nd Oct., 1883, and reported herself cured. Both feet perfect. A month previously an ivory peg painlessly appeared at a small opening and was drawn out.
9	M	14	School Boy	Right and Left	9th Oct., 1883	Afebrile recovery ...	27th Nov., 1883	Sent home with every appearance of being perfectly cured.
10	F	12	Farm Servant... ...	Right and Left	8th Dec., 1883	Afebrile recovery ...	... ...	Still under treatment: giving every promise of a good result.

THE EFFECTS OF CERTAIN ANATOMICAL RELATIONS.

A Lecture delivered before the Medical Society, Charing Cross Hospital.

BY

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MR. PRESIDENT AND GENTLEMEN,

It is my intention to give you a short epitome of some reflections, which, during a twelve years' course of anatomical teaching in this school, have occurred to me at different times. Most anatomical teachers have within their own store book of knowledge, unpublished thoughts and theories, which never see the light, but I have determined to set mine forth, criticise them as you may.

ON THE RELATIVE WEIGHT OF THE RIGHT AND LEFT SIDES OF THE BODY.

It is believed and largely taught that the right side of the body is heavier than the left, and very pretty theories have been advanced accordingly as to the use of the right hand. The organ to be looked upon as yielding the predominant weight is the liver, which, weighing as it does 50 ozs., has only the spleen, weighing 7 ozs., to balance it; for the kidneys all but weigh the same; the pancreas lies a little more on the right than the left; the right lung is 2 ozs. heavier than the left; and the only other organ throwing weight into the left scale

is the heart, which presents a little more on the left than the right side.

A table of proportionate weights yields this result:—

	Right side.	Left side.
Liver	$44\frac{1}{2}$	$4\frac{1}{2}$
Pancreas	$1\frac{3}{4}$	$1\frac{1}{4}$
Spleen	0	7
Lungs	20	18
Heart	$2\frac{1}{2}$	$6\frac{1}{2}$
Kidneys	$4\frac{1}{2}$	$4\frac{1}{4}$
	$73\frac{1}{4}$ ozs.	$41\frac{1}{4}$ ozs.

Hence the right side according to this table is heavier than the left by $31\frac{3}{4}$ ozs.

Now what are the facts? On carefully dividing the thoracic and abdominal viscera, by a central incision from the top of the sternum to the symphysis pubis, it is found that the *left*, not the right, but the viscera on the *left* side of the body weigh $13\frac{1}{4}$ ozs. more than the right, *i.e.*, not only is the deficiency of $31\frac{3}{4}$ ozs. made up but there are $13\frac{1}{4}$ ozs. to the good. What is there then to make up this $31\frac{3}{4}$ ozs. + $13\frac{1}{4}$ ozs. = 45 ozs. upon the left side? There is the intestine, and it is the intestine, and chiefly the small intestine, which makes up this lee way. The small intestines lie chiefly on the left iliac fossa and also in the pelvis between the bladder and rectum. The effect of the first position is to compensate for the weight of the liver on the right and balance the body; and the effect of the latter position is to carry the focal point of the body weight below the centre of the axis of the weight of the body.

Here then is ground work for theorists to work on.

They will find it much more easy to explain how the light (right) side rotates forwards whilst the heavier (left) drags behind. They will also find food for discussion, in the fact that, the heavier side has its over-load low down below the centre of balance of our bodies, whilst the right has its over-load above that point, and which acting without compensation, would unbalance the body and lead to an unstable gait. How that there is a spiral idea in having the weights at different heights on opposite sides. They may even indulge so far as to account for the left foot being the one chosen to mark the time on a march to music. Whatever explanations may come out of it, these are the facts, that the left side is heavier than the right, and that the small intestines are the cause of this surplus of weight on the left side.

A general survey of the body viscera reveals the fact that the viscera containing air, and consequently the lightest, are seated the highest and above the diaphragm, whereas the heavier contents, fœces and urine, find their way from above downwards until they are met with in quantity at the lower part of the abdomen. The position of the stomach, liver and spleen so close beneath the diaphragm and up under cover of the cartilages of the ribs gives food also for much comment. In the first place it is to be noticed, that the stomach is but a weak-walled organ considering the amount of muscular work it has to do; that the bile flows through the liver in channels destitute for the most part of muscular fibres; and that the spleen, an organ of recesses and fibrous network, has few muscular fibres in its tissue. Birds have no diaphragm but have gizzards, and one cannot help associating the two facts and relegating to the diaphragm the function of helping a weak-walled stomach in its action. We are apt

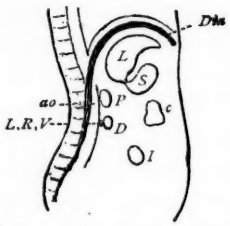


Diagram of vertical section through the median line of body showing the relations of the diaphragm:—
Dia. diaphragm. L. liver. S. stomach. P. pancreas. C. colon. D. duodenum third part. I. small intestine. Ao. aorta. L.R.V. left renal vein behind duodenum.

to consider the diaphragm a transverse partition, but the accompanying diagram shows how much more perpendicular it is, and how it slopes down behind the liver and stomach. The spleen is also within its grasp, and so it comes about that the diaphragm not only descends, but also advances forwards, thus throwing the liver, stomach and spleen against the anterior wall of the abdomen. The tension of the muscles therein contained is overcome, and the wall advances; but during the process the three viscera mentioned are pushed against the wall and are thus compressed, the weak-walled stomach is thus aided in its action; the bile is helped along the non-muscular biliary capillaries and the blood is aided in its struggle through the open mesh-work of the spleen. Supposing the abdominal wall is held rigid whilst the diaphragm contracts, vomiting takes place, and soon bile finds its way into the stomach, showing that the stomach is compressed between the diaphragm and the abdominal wall and that the bile is squeezed out of the liver. These statements are known to all, and we find conviction follows without further argument. Besides, is it consistent with the nature of things that much of the force generated by the contraction of the diaphragm should be lost? If it can be made mechanically useful is it not a conservation of force to employ it? The descent of the diaphragm by its aspiration fills the thorax with both air and blood, and are the organs below to be denied any good therefrom? As it aids respiration and circulation so it aids digestion,

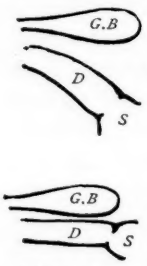
and the three all-important functions of our vegetative life are made to harmonise and depend on each other through this common agent the diaphragm. I would go further and say that just as every cranny and nook of the lung is affected by the action of the diaphragm and is covered by pleura to allow of the motion consequent on that action, so is every organ in the abdomen which is covered by peritoneum affected by the same muscle.

There are numerous other points to be considered in the relations of the abdominal viscera, but space will not admit of entering into them in detail. In short, notice how the main mass of the small intestines, the heaviest piece of viscera in our bodies, rests between the bladder and rectum below the level of the central balance of our bodies. Notice also the position and structure of the colon. The ascending colon, so wide in its calibre and with walls incapable of perfect contraction, must have difficulty in its effort to drive its contents along. Its position would induce one to believe that it would be better filled during the horizontal position; and who, after being amused at the idea, will not be convinced that it is during sleep that the contents find their way up the ascending colon, and for that matter along the transverse colon during rest on the left side. On getting out of bed and assuming the erect position the fœces by gravitation are helped down the descending colon, and by the time breakfast is over the contents have arrived at the anus in the form of the "morning stool."

Again, notice the position of the third part of the duodenum and its relation to the left renal vein (see diagram). The vein is placed directly between the aorta and the duodenum; when the duodenum is full the blood in the vein must have rather a struggle to get along, and

not only is the left so placed but the right renal vein is covered by the second portion of the duodenum. Can it be that these have to do with the renal congestion which ensues after each meal? Does the full duodenum cause an increased pressure on the renal veins and thence on the malpighian tufts, thus providing for elimination of fluid, &c.? Laugh at this first and think of it afterwards, and make a better explanation than my poor attempt, and although I have not convinced you, if I have stimulated you to think about such matters I have obtained all I wish.

At examinations it is a common question, "Do you see the first portion of the duodenum when you open the cavity of the abdomen?" The candidate, taught by his teacher to say yes, may be shown by the examiner that it is not so, but also *vice versa* may take place, so that it is not a settled question. Now the real fact is, that when the stomach is empty the duodenum in its first portion is to be seen, but when the stomach is distended the duodenum disappears under the liver. Not only so, but look exactly where the duodenum does disappear to, and you will be led along the gall bladder from fundus to neck, and the direction of the first portion of the duodenum when the stomach is full is seen to be parallel to the long axis of the gall bladder. Does this suggest anything? Would not the pressure exercised by these two on each other be greater when they are full than when empty? When are they full? The duodenum is full during digestion and the passage of food from the stomach. The gall bladder is



Relation of D. duodenum and S. stomach to G.B. gall bladder. A. when the stomach is empty; B. when the stomach is full.

being constantly filled between meals, but is emptied of its contents during digestion, and bile is found ready in quantity in the second portion of the duodenum to meet the food as it leaves the stomach. Hence during digestion they are both full; and the first portion of the duodenum, tucked under the liver by the forward swing of the greater curvature of the stomach when full, presses against the gall bladder from fundus to neck. Muscular fibres in the gall bladder are scarce, and it has always been a perplexing question how the gall bladder empties itself—galvanic stimuli exciting but slow and meagre contractions therein. Here is a means by which a full stomach and duodenum provide for the flow of their own bile, and the fuller these are the more will the gall bladder be pressed upon and consequently the more completely emptied. Why fly off to central nervous and reflex nervous influence, when a mechanical explanation is at hand? Is the mechanical less wonderful than any other explanation? It is usual to ascribe it to vital, nervous, reflex or any of the other cloaks of ignorant subterfuge which men take to when every other escape fails.

Has it ever struck you as anything peculiar that veins and arteries should run so persistently and so closely together? Has it ever occurred to you that one might derive help from the other? If so, it must be the strong which gives help to the weak, namely, the artery to the vein. The veins and arteries in the limbs more especially are enclosed in a common sheath; now the blood rushing along an artery would tend to fill the sheath and drive all the blood in the veins back the way it came. To prevent this, valves are inserted in the walls; and these, supporting the blood until such time as the arterial wave has gone on, keep the blood ready to occupy the spot where the

pressure becomes negative. Thus the venous blood is piled up as it were by the current in the artery, and kept ready until the removal of the pressure allows its onward course. As an example of the effect of the relation of arteries to veins, take the common iliac arteries and veins. The veins and arteries on the front of the fifth lumbar vertebra are so placed that the veins are on a plain posterior to the arteries, and they seem plastered against the vertebral column. Now when the artery contracts there is less resistance to the passage of venous blood, but when the arterial wave is passing, the blood which is in the veins must be stemmed, and an accumulation will occur in the iliac veins of the left side, which accumulation, the moment the artery contracts, will allow for a larger rush of blood than would otherwise happen. Is it not possible, also, that the sudden expansion of the artery upon the full vein may give the blood in the vein a help and a flip, by which it will pass up the long valveless cava? That there is a difficulty for the venous blood to pass there, is to be made out by—

1. Trying to pass a dissecting-room blow-pipe along it when the arteries are distended with injection.

2. During disease, when phlegmasia dolens exists, many museum specimens show that a thrombus extends all the way up to, but not beyond, the crossing of the left common iliac vein, behind the right common iliac artery, thus helping the notion that if fluid blood found it difficult to pass, clotted blood found it impossible.

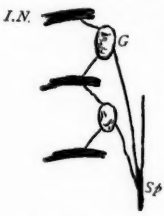
3. The consideration that phlegmasia dolens of the right lower extremity is more often fatal than upon the left, and as the venous blood in the right iliac veins can pass more easily than in the left, so also may a clot more easily pass and thus account for the phenomenon.

Space will not allow of a further prosecution of the consideration of the relation borne by arteries to veins, but if I have set you agoing thinking in that direction it is something.

I now wish to draw your attention to a subject which I discussed before you some six years ago. Whilst preparing a frog's sciatic nerve for a physiological demonstration, I noticed a peculiar, but very decided, spiral or coiled appearance of the components of the nerve trunk. On stretching the nerve the coiling disappeared, but on relaxation it appeared again. I, at that time said, I believed it had something to do with allowing the nerve to accommodate itself to the flexion, extension, &c., of the hip, and since then I have inspected most of the nerves in the human body from this point of view. I find now, that all nerves which are in a position to be stretched, present the same (naked eye) spiral or coiled appearance, as I met with first in the frog's sciatic. Beautifully marked is it in the nerves of the tongue and penis; in these structures one would expect to see it if it existed, owing to the frequent variations they undergo in length. In the nerves of the bull's penis I found it beautifully marked now some four years ago. Nerves running through long canals, such as the superior maxillary nerve in its course through the infraorbital canal, do not show it. So, the nerves of the hand and foot, as they approach the end of their course lose the appearance; the median and ulnar about half way down the fore-arm cease to show it, and the nerves of the leg, markedly the anterior tibial, are destitute of any such condition. The nerves mentioned are obviously not so likely to be affected by the limited motions of the wrist and ankle as are those crossing the knee and elbow. Hence almost all the

trunks of the nerves in the extremities as low as the knee and elbow, show it well. To begin with,—let me advise you to look for the condition mentioned in the sciatic nerve and the cords of the brachial plexus; and you will at once see what I mean. I intend soon to give you a table of the nerves in which this condition is to be met with.

Before finishing, let me draw your attention to another fact that has often attracted my attention. It is this:— On fixing your attention on one of the dorsal ganglia of the sympathetic, and then moving the head of the rib, it will be seen that the ganglion is affected by the motion of the rib; it is pressed upon alternately at its upper and lower part as the rib rises and falls. Also observe that when two nerves leave a ganglion to join the intercostal nerves, one goes from the upper part of the ganglion to the nerve above, the other from the lower part of the ganglion to join the intercostal nerve below. Hence the upper and lower part of each dorsal ganglion are affected alternately by the upward and downward movement of the ribs, and each intercostal nerve receives a filament during both actions. Observe also it is only in the thorax, where the ganglia lie so far back, in the abdominal region especially they come forward to near the middle line. Why do these ganglia lie so far back in the dorsal region? Is it because of giving filaments to the intercostal nerves? No! the lumbar ganglia give similar branches, and they are connected by nerves three or four inches long. Besides these branches to join intercostal nerves, splanchnic nerves supplying the liver and all the upper abdominal viscera arise from the



G. right dorsal ganglia.
I.N. intercostal nerve.
Sp. splanchnic nerve.

dorsal ganglia. Are there not some physiological and clinical observations about the glycogenic function of the liver being interfered with, when the ribs, with which these ganglia and nerves are associated, are broken? In other words is this communicated movement purposeless, is this tilting of the ganglia useless, is the course of the dorsal ganglia over the heads of the ribs accidental? That dare not be said; and one is driven to the conclusion that some purpose is served by it, be that a mechanical stimulus by which inhalation prompts exhalation, or *vice versa*, as the upper and lower part of the ganglia and so the intercostal nerves are alternately affected; or is it that some useful stimulus is conveyed to the splanchnic nerves as they proceed to the abdominal viscera?

I am much obliged to you for the way you have listened to these few points which have occurred to me, and whilst hoping they may be interesting to you to consider, I hope at some future time to continue the subject in greater detail.

ON GIVING REST TO THE DIGESTIVE ORGANS BY THE USE OF PEPTONISED FOOD.

BY

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EVERYONE knows and understands the great need for giving rest to organs in the carrying out of a rational line of treatment—especially in regard to organs which are inflamed. We often want in our practice to give entire repose to organs; yet we have to confess our inability, for want of knowledge and means, to fulfil the indication; again, having the means at hand, we hesitate lest the very inactivity we *could* bring about should imperil the well-being of other organs or even of the whole being. But our ignorance and inability of to-day give place to-morrow to knowledge and ability; hesitation is changed to confidence and safe action. We must always have a great deal more of physiological knowledge than we can make use of. Yet many workers are digging at the physiological quarry, and continually material is being carried away to be used with effect in the building up of our ever-perfecting house of Practical Medicine. And a good deal of shaping and fitting is needed, and much patient trial, before a method or a means can be safely considered fit for the storehouse of practical precepts—to be acted upon with certainty, by all, for the common good.

Now, it is not so very long ago that there was got out

of the physiological quarry some material which, now shaped and tried, is at the disposal of everyone to secure absolute physiological rest for the stomach in many conditions where such rest may be more or less urgently needed. The preparation and use of peptonised food is one of the most recent and acceptable of the many practical applications of physiological science to practical medicine. In this paper I propose to speak of the treatment by peptonised food in general—its foundations in physiology—and this as a prelude to the examples of its use in a particular form of disease—gastric ulcer, to wit—which are given in another part of this book.

But first let me say a few words about this physiological rest that we so often desire to compass as preliminary to our treatment, or as the chief part of it. The term itself, physiological rest, is perhaps not a good one, but I mean this by it—the relief of an organ from some or all of the work incident to its special functions. Organs have work to do beyond that which is necessary to their own life, and it is from this additional and, for each organ, special work we often need to spare organs. As yet, it must be confessed, we are very far from knowing how such relief and rest *could* be given to most organs of the body. In respect of the brain or spinal cord, for instance, with such means as we have, unless we extinguish altogether their proper functions, we are confronted with incidents and consequences which make us hesitate to use our means except when urgency and hopelessness demand our action.

Disease may sometimes secure rest from special functional activity whilst not extinguishing the life of the organ or part. Special function is in abeyance in the lower lobe of a lung when it is the seat of croupous

pneumonia; air is excluded, aeration is impossible, all the activities pertaining to the special function of the lung are laid to rest. Now, in certain forms of phthisis the lung has not only to bear the burden of its own diseased state, but also the burden of its special function, and this when already lamed by disease. So that, the having this rest may be in the pneumonic lung a help, and the want of it may be in the phthisical lung a hindrance to the proper recovery from their respective diseased conditions. We often desire in our treatment to give rest to organs by restraining mechanical movement. Thus, we may strap the chest in pleurisy; or restrain peristaltic action in the intestine by means of opium. But our task is not so easily made good in regard to most organs.

The stomach is a very difficult organ to deal with. To give the stomach the complete rest we often need to give it we must arrest motion *and* special function. In the presence of structural disease it will not do to use half-measures. There is nothing for it, in order to give the stomach relief from all its work, but to withhold from it all ordinary proteid food, all stimulus of whatever kind.

Let me recall some of the knowledge we have as to the stomach and its work. As to the movements of the stomach: these do not seem to depend on mere fulness of the organ, or amount of food in it; they are slight and feeble at first after a meal and when the stomach is fullest; they grow in strength as digestion goes on; they keep pace with the acidity of the contents of the stomach—the more acid the more movement, the less acid the less movement. When quite empty the stomach shows none of its peculiar muscular action, and it is then contracted. We know little of the nervous mechanism of the gastric movements. It is, however, significant that after section

of the vagi (the only nerves that seem to be concerned in the movements of the stomach), and irritation of the peripheral ends, movements are set up *only* if the stomach is full; there is no response when the organ is empty.

As to the special function of the stomach, its secretion of gastric juice: We know that slight mechanical stimulation causes a slight pouring out of the secretion; that the greatest amount of effect in this direction is caused by the presence in the stomach of a dilute alkali—even the presence of a small quantity of saliva causes a flow of gastric juice. When the stomach is empty the mucus membrane is pale and grey; the surface of the empty stomach is barely moist, and yields no decided acid reaction (Leube). The influence of nerve-action upon the secretion of gastric juice seems to be small.

From all we know, it would seem as if the amount of muscular action in the stomach depended more upon the quality and state of the contents of the organ than upon mere mechanical stimulus. And as regards secretion of gastric juice, it would seem as if this, too, depended upon the quality and state—especially the chemical state—of the contents of the stomach.

I think we may say this with certainty—that we *can* arrest motion *and* secretion in the stomach, and so give physiological rest to the organ. But we can only certainly and completely arrest motion *and* secretion by entire withholding of food.

Yet, after the reflection which all the facts of the case invite, it seems to me that some further considerations are suggested. The actions of the stomach (both muscular and secretory) seeming to depend upon qualitative properties in the food—whatever they may be,—it is as if the actions went hand in hand with the amount of work

required to be done. And we get this suggestion, which may be in the nature of a principle, that the more the ingesta approach the qualitative state of the completely digested food—in so far as stomach digestion is concerned—the less will the activities of the stomach, both muscular and secretory, be called forth. Certain it is that the clinical results we gain by acting as if this suggestion were a well-ascertained principle go far to confirm its reasonableness and its foundation in fact. Wherefore, I think we may go further and say: that we may rest the stomach more or less by feeding it with ingesta already so altered in state and quality as to be more or less in the state and quality of matters which have undergone complete digestion.

In some organs function goes on well enough for the general wants of the body, even though a part of the organ be inactive from disease. But, for the stomach, abeyance of special function means a cutting off of the source of nourishment and life from all other organs, and even the whole organism. If we cut off all supply of nutrient material through the stomach, we must, to support life, find some means not only to convey nutrient material into the circulation, but to convey it in a digested form—and this means in something more than a soluble form.

Everyone knows that the work done by the stomach is upon the proteid elements of food; that under the joint influence of heat, acid and ferment the proteid foodstuffs dissolve and break up, and become changed into highly diffusible peptones. The work is not, however, quite so simple as it may appear to be. The process of gastric digestion is a complex process, and not yet so unravelled as to enable us to dispense with theory.

Speaking broadly, the process is essentially a chemical process—of that kind called *hydration*, or hydrolytic decomposition—whereby the large, complex and unstable molecules of protein split up into definite and more stable constituent substances; whilst at the same time a change in physical state occurs, the insoluble colloid being changed into soluble and highly diffusible crystalloids. This change is effected through the agency of the ferment, pepsin, in the presence of water and acid. And a salient point in regard to these changes is this: that in the more strictly chemical metamorphoses during digestion molecules are so re-arranged as to provide for reconversion, after absorption, into the proteid form again, and thus to aid in those synthetic changes upon which the building-up of tissues depends. The change from proteid to peptone, in the stomach, is effected in stages, and with the appearance of intermediate products. A proteid, undergoing stomach, or peptic, digestion, seems to split up chiefly into two groups—so called anti-albumose and hemi-albumose—from each of which two somewhat differing peptones are formed. One of these peptones—anti-peptone—is the final and completed product; it is complete in those properties which fit it for immediate introduction into the circulation, and accordingly, in the stomach, it is at once absorbed. The other peptone—hemi-peptone—may be said to be incomplete; it is capable of being still further split up and changed before absorption. But not in the stomach or by peptic digestion. This further change takes place in the small intestine, and through the agency of the ferment of the pancreatic juice, trypsin, in the presence of water and alkali.

As is well known, the pancreatic juice is capable of

converting proteids into peptones; and the mode of conversion is on the same lines as in the case of the gastric juice, yet differing in important ways. When trypsin acts, in proper conditions, upon a proteid, two groups of intermediate products are formed—anti-albumose and hemi-albumose. Comparing these two with the corresponding products of peptic digestion, we find that there are certain differences between the tryptic and peptic products: those formed in the stomach are akin to syntonin or acid-albumin; those formed in the intestine are akin to alkali-albumin. Further, whilst pepsin has no power to split up or otherwise alter the properties of either of its peptones, trypsin has the power to split up and alter one of its peptones, the hemi-peptone, to wit. Pancreatic juice can do, in fact, all that gastric juice can do in the way of peptonising proteids, and something more—it can split up hemi-peptone into leucin and tyrosin and other less important things. Now leucin is a fatty body (amido-caproic acid), and tyrosin belongs to the aromatic group, and is akin to benzoic acid; they are crystalline nitrogenous bodies, and their capacities in regard to metabolism are great. Besides the digestion of proteids, pancreatic juice can effect the digestion of fats (aided by the bile) and of starch.

The question next arises—Can we imitate and bring about out of the body the processes of digestion, with the results just now set forth? If we can, the tryptic or pancreatic process of digestion is clearly the best to imitate. And there is no longer any doubt that we can in all essential points bring about out of the body to raw material the same changes that tryptic or pancreatic digestion brings about in the bowel to our food. Long ago, by means of pepsin (prepared artificially from the

actively-digesting stomach of the pig) and acid and heat, the process of gastric digestion was fairly imitated out of the body. At the present day, by means of pancreatic extract and alkali and heat, the more complete process of intestinal digestion is imitated almost exactly and easily out of the body, and now daily in our hospitals, and even in private houses. And in this way a great variety of pleasant foods are prepared, whose use, in a ready-digested form, is attended with much success.

As to the means used in artificial digestion—peptonisation, as it is called—first, we must have the special ferment. It is found that by treating the pancreas of the pig with dilute spirit a very active extract of the pancreatic juice can be obtained. An active and efficient extract of fairly constant strength is now made on a large scale in commerce, the extract known as Benger's Liquor Pancreaticus being, perhaps, the best. The natural ferment being thus at hand, for the rest it is a mere matter of being able to secure the proper physical conditions—temperature, and alkaline state, and time—in order to digest artificially almost any of the chief food-stuffs we please.*

Now, finally, in order to secure complete rest to the stomach, we need to introduce into the circulation the food we can thus artificially digest through some channel other than the vessels or membranes of the stomach and small intestine. It is well known how little we could do in the way of supporting life, for more than a day or two, by the use of what I must now call the old-fashioned nutrient injection. And the reason is clear: we could

* For details as to the preparation of peptonised milk, beef-tea, gruel, and other farinaceous foods, consult the article on Peptonised Food, by Dr. William Roberts, in Quain's *Dictionary of Medicine*, or Dr. Roberts' *Lumleian Lectures*.

not reduce the food before injection into the rectum to a soluble and peptonic form. With the means now at our disposal we can, out of the body, reduce proteids to the soluble and peptonic form; and we can at the same time, and by the same agency, convert starch into dextrin and sugar, and we can peptonise milk. We can prepare an enema which is, in its likeness to digested chyle, nutrient indeed. We are, therefore, limited only by the capacity of the rectum to absorb such food, in our efforts to support life for many weeks whilst we give the whole alimentary canal absolute rest from all digestive work. Now, it has been established experimentally that peptones and sugar have been completely absorbed by the large intestine after injection *per anum*. We need, I think, no other scientific proof than this of the certainty of absorption after rectal injection, of soluble and peptonised food.

Clinical Records.

TWO CASES OF GASTRIC ULCER TREATED BY PEPTONISED ENEMATA. By Drs. SPENCER and SHAW, Physicians to Bristol Royal Infirmary.

A. C., æt. 20, dressmaker. Admitted to Bristol Royal Infirmary, under Dr. Spencer, on April 9th, 1883. Had been under medical care for previous two or three years on account of anæmia and palpitation. Pain and tenderness at the epigastrium, made worse by food, and sickness for three months; has had frequent fainting fits. Three days before admission vomited a teacupful of dark-brown blood. On admission, extremely anæmic and weak; much pain, especially after food, and tenderness at epigastrium; no appetite; systolic pulmonic murmur; pulse 120, feeble; temperature normal. April 10th: Bowels opened by simple enema; motion very dark. April 11th: Vomited about 6 oz. of blood and clot; this repeated to same amount later in the day; motions quite black. April 13th: Nutrient enemata commenced to-day; to have no food or medicine by mouth. Each enema consisted of—Brandy, half an oz.; half an egg; Brand's essence of beef, two drachms; peptonised milk to 4 oz. An enema was given every four hours, and once in the twenty-four hours the bowel was washed out with lukewarm water. Two days later, on account of thirst, was allowed a very little peptonised milk to sip. No change was made in this treatment until April 27th (the 15th

day). Then, there having been no vomiting, pain or hæmorrhage, nor discomfort of any kind, and the patient having improved greatly in appearance, the enemas were discontinued, and the patient was fed by the mouth with peptonised milk. In two days ordinary milk and lime water was substituted; then beef-tea was added. On May 2nd chicken was allowed. May 7th: There had been no symptoms, and patient felt quite well; was then put upon pills of sulphate of iron and carbonate of potash. May 9th: Patient got up. May 16th: Patient left the Infirmary. She continued to take the pills, as an out-patient, for some time, and finally was completely cured of the anæmia. In January, 1884, the patient was maintaining her health, was of good colour, and said that she had never felt so well in her life.

F. S., æt. 26, domestic servant. Admitted under Dr. Shaw. Had suffered from indigestion for a year, more severely for the last six months, but had never vomited. On December 14th, 1883, while walking in the street, became suddenly faint, and then vomited a large quantity of blood and food; was taken to Infirmary, where on arriving she again vomited, a pint of "coffee-ground" vomit being brought up. Was given a hypodermic injection of ergotine, and placed on diet of milk and beef-tea. Heart, lungs and urine revealed no abnormality. December 15th: Ordered bismuth mixture. Two attacks of hæmatemesis, amounting to two pints, preceded by gnawing pain in epigastrium. December 16th: Stomach rather distended; no tenderness on palpation. Tongue, white fur. Pulse sharp and collapsing. Tarry motion passed after simple enema. No vomiting. December 17th: No vomiting; no pain or tenderness in epigastrium. Ordered bismuth and morphia in powder and ice

to suck. December 18th: Tarry motion after enema. Two attacks of hæmatemesis—22 oz., preceded by feeling of faintness, but not by pain. Ordered Pulv. Acid. Tannic. gr. x. quartis horis sum.; nothing else of any kind whatever to be taken by the mouth, but every four hours enemata, consisting alternately of 4 oz. of peptonised milk and of the peptonised solution of beef, to be administered regularly day and night. Patient excessively blanched. December 19th: Well able to retain enemata; bowels not moved. Vomits after Tannic acid. Complains of extreme thirst, but no pain. Pulse sharp and jerky; well-marked bruit in pulmonary area. December 20th: Half-doses of Tannic acid vomited, but without trace of blood. Bowels not moved. Free from all pain. Allowed a little iced water by mouth, and ordered Pil. Opii (gr. ½) ter die. December 23rd: Bowels still unmoved. Ordered twice daily one of Slinger's nutrient suppositories; treatment otherwise unaltered. December 24th: Bowels moved during night; motion light-coloured and loose. No vomiting. Some pain, but no tenderness in epigastrium. December 27th: Vomited twice yesterday; thin fluid, without trace of blood; neither nausea nor pain before vomiting. Bowels moved; motion light and loose. Still very thirsty. Tongue dry. Nutrient enemata increased to ʒ vj. each, as they are retained without difficulty. December 28th: Vomited twice. Pale watery motion passed, showing no sign of blood. Opium discontinued yesterday. December 31st: For last two days there has been diarrhœa, with griping pains in bowels; motions very offensive. Ordered to take creasote in pill as well as opium, which was recommenced. January 2nd, 1884: Pain and diarrhœa relieved; bowels moved once to-day. Tongue dry, with brownish fur. No difficulty in retaining

enemata. January 7th: Vomiting continues absent. A light-coloured motion passed on the 5th. Tongue moister, and patient begins to feel hungry. January 8th: A light loose motion passed to-day after three days' confinement. To-day patient is allowed to have the peptonised milk by the mouth, having taken no nutriment by that method for twenty-one days. Enemata to be continued every four hours as before, the peptonised solution of beef alone being used for that purpose. During the preceding three weeks patient has gained strength considerably, *probably* lost weight to some extent, and not perceptibly improved in respect of the deficiency of hæmoglobin caused by the hæmatemesis. January 11th: Peptonised milk by mouth increased to two pints. January 14th: One egg, beaten up, added to food by mouth; nutrient enemata continued as before. January 18th: Bowels are moved daily; motions rather dark and loose. Has had arrowroot in addition by mouth since 16th. Nutrient enemata four times in the twenty-four hours. January 21st: Patient lifted out of bed and weighed; weight, 7st. 3lb. January 22nd: Milk cake added to diet. January 24th: Has no epigastric pain now. Pills of opium and creasote discontinued, and pill of aloes and iron given instead. Nutrient enemata to be left off to-day, having been employed continuously for thirty-seven days. Throughout patient retained them easily, and suffered no inconvenience from them. January 28th: Weight, 7st. 6lb. Bread added to diet, and beef-tea given instead of the peptonised milk. January 31st: Bowels confined; pain in chest. Aloetic pill increased in strength. Fish added to diet. February 4th: Weight, 7st 11lb. Bowels now moved daily. Patient allowed to get up for an hour to-day. February 11th: Weight, 8st 3lb. Gets up for three hours daily; has some giddi-

ness on first rising. To have meat finely minced for dinner. February 12th: Hæmoglobin estimated at 60 per cent. Corpuscles at 3,960,000 per cubic millimetre. February 18th: Weight, 8st. 7lb. Is up all day now. Constant slight pain in chest not influenced by food; not conscious of any other discomfort. Has not vomited since December 28th. Will be discharged in a day or two.

This case is a good illustration of the efficiency of peptonised enemata to maintain life for a prolonged period, without any assistance from digestion by the stomach and small intestine. It also shows the great value of rest to the stomach in the treatment of gastric ulcer. Notwithstanding the alarming hæmorrhage from the stomach, none such occurred again when, by no longer putting digestible substances into the organ, the fluxionary hyperæmia of digestion was no more induced. That the powers of digestion were increased by rest rather than diminished by disuse is shown by the rapid gain in weight when a moderately liberal diet permitted its occurrence.

CASE OF SPONTANEOUS CURE OF SPINA BIFIDA, FOLLOWED BY HYDROCEPHALUS.

By E. Long Fox, M.D., F.R.C.P., Consulting Physician to the Bristol Royal Infirmary.

The mother of this patient states that in the middle of the sixth month of pregnancy a furious fowl flew up against the window, at which she was standing, and frightened her so much that she fell to the ground in a sitting posture.

The child was born at full time, and seemed much like other children, except that she suffered from spina

bifida, extending from the eighth dorsal to the first lumbar vertebra. There was a slight discharge of clear fluid from the diseased spine. The head was in good proportion to the rest of the body.

After about four months the orifice in the spine became closed over, and no fluid escaped.

When the child was twenty-six months old her state was as follows:—

"The spina bifida, covered in by soft parts, extended from the eighth dorsal to the first lumbar vertebra. From the root of the nose to the occiput the head measured twenty-three inches. From one ear to the other over the vertex twenty.nine inches. The face was small. The eyelids nearly closed. Convergent strabismus. She was unable to raise the head, or to keep it upright when raised by others. She lay always with the head supported. Joints rachitic. No power of standing. No deep reflexes. Involuntary passage of excretions, as in an infant, Mental faculties probably not absent. She showed a distinct liking for music, and seemed to be aware of the presence of her parents. She could move her arms and legs feebly. Sensation to pain good. Swallowed well. Had cut eight teeth. Hair scanty."

In the twenty-ninth month of her age this child died of acute bronchitis. A partial examination was allowed.

"The spinal bones and canal were healthy from above downwards to the eighth dorsal vertebra. Here the spinous processes were absent, and indeed nothing but the bodies of the vertebra remained. The bodies here diverged somewhat to the right. They were rather prominent and formed a lateral bulge. They were very soft and their internal tissue in parts almost grumous. The dura mater spinalis was thickened throughout, and in

many places, especially on the anterior surface, was closely adherent to the soft membranes. About the level of the sixth dorsal vertebra the pachymeningitis had caused some constriction of the cord. The soft membranes were somewhat thickened. The cord seemed healthy down to the level of the sixth dorsal vertebra, except that the central canal was large enough to admit an ordinary blowpipe.

"At this spot this central canal was closed. A little below this spot, about the level of the eighth dorsal vertebra, the arrangement of the cord on its posterior aspect showed an almost complete absence of the posterior columns. The central canal was exposed down to the cauda equina, but the constriction at the level of the sixth and seventh dorsal vertebra prevented any communication between this lower portion and the dilated central canal above. The nerves of the cauda equina were matted together in a mass of thickened membranes.

"The medulla oblongata seemed healthy.

"The left hemisphere of the cerebellum was much atrophied. The head measured the same as when seen three months before. The parietal bones were large, but healthy. The frontal sent a long process towards the vertex. The occipital sent a similar process towards the vertex. A very large space at the top of the head was not closed in by bone, but was tented over by a thick fibrous membrane, from which the integument could be easily separated. About the middle of this fibrous tissue, slightly to the right side, the brain and its membrane were adherent to it. The convolutions were flattened, but not otherwise unhealthy. On opening the lateral ventricles nine pints of clear fluid escaped. The third ventricle much enlarged. No granulation of the epen-

dyma of the ventricles. No tubercle. The corpora striata stood out prominently; but all the other basal organs were flattened out beyond recognition."

Very frequently congenital hydrocephalus is associated with congenital hydrorachis. In this case the hydrocephalus was certainly not congenital. From its originating after the cessation of the flow from the bifid spine it was certain during the life of the patient that the fluid came from the central canal. In the face of such a disastrous sequence to nature's efforts for a cure of the congenital malformation, the question of endeavouring artificially to remedy a bifid spine is not free from all anxiety. Such a malformation is not unusually associated with arrest of development in other regions of the nervous centres; and although the enlargement, or rather the insufficient closure of the central canal in such cases is by no means the rule, yet the sequence of events above described is sufficiently common to induce the belief that the co-existence of the two forms of arrested development may materially interfere with surgical success.

CASE OF RUPTURE OF THE RIGHT AURICLE OF THE HEART.

By GEORGE THOMPSON, M.D., L.R.C.P. (Lond.); Medical Superintendent of the Bristol City and County Lunatic Asylum.

Ann Darvill, aged 69; admitted in 1878; died on the 13th of November, 1883.

When admitted, and during the whole time of her residence in the Asylum, she was the subject of very abject melancholy, and took sparingly of food. She was quiet in all her movements.

On the evening of the 12th of November, about six o'clock, shortly after she had taken her tea, I saw her. She was in a state of utter collapse, and had previously complained of pain starting at her heart and shooting down her legs. A stimulant mixture was given her and she was put to bed. Later in the evening she had rallied slightly, but it was quite evident that she was moribund. The pulse throughout the whole period was small and irregular, and no definite alteration of the sounds of the heart, or in the area of cardiac dulness, was up to midnight perceptible. She died at four o'clock on the following morning.

At the autopsy, all the organs were in a condition consistent with health, except the heart. The sac of the pericardium was distended with about four ounces of fluid, partly serum and partly blood. I passed my finger over the surface and discovered a rent in the right auricle sufficient to admit the finger to explore the cavity of the ventricle. On removal of the heart about three ounces of coagulated venous blood was found infiltrated through the areolar tissue surrounding the points of origin of the great vessels. There was no sign of disease in the ruptured parts, but the walls of the right auricle were particularly thin.

NOTE.—It would appear from the length of time—ten hours—which elapsed from the onset of the attack to death, that the rupture occurred at first outside the serous layer of the pericardium, among the roots of the great vessels, and that, by degrees, the opening was enlarged until it extended low enough to rupture the pericardium and fill its cavity, which was the immediate cause of death.

Rupture of the heart is a very rare accident, and is said to affect the ventricles more frequently than the

auricles, and the left ventricle more often than the right. In fact, after carefully searching through such books on the subject as are within my reach, I am induced to think this case to be quite unique. Moreover, in most cases recorded, distinct fault of structure, such as aneurism, is invariably reported; but my case is all the more singular, inasmuch as, with the exception of thinness, due probably, to old age, no disease whatever was discovered. The very quiet life which, for five years before, had been led by the patient makes the case all the more remarkable, and one which, in my opinion, deserves to be placed on record.

CASE OF SUCCESSFUL IMMEDIATE SUTURING OF THE OLECRANON FOR SIMPLE FRACTURE.

By W. P. KEALL, M.R.C.S., Surgeon to the Bristol General Hospital.

SAMUEL TAYLOR, æt. 33, Cab-driver, was admitted into the Bristol General Hospital, November 28th, 1883, with a simple fracture of the olecranon, caused by a blow with a heavy iron bar, inflicted on the arm, which was raised to protect his head. The fragments were separated more than an inch when the arm was straightened. He was suffering severe pain, there was some swelling and a good deal of deformity about the elbow, but very little ecchymosis, one small spot of skin, however, about 2 mm. in size was severely bruised.

November 29th, the operation was performed in the following manner: An incision about four inches long was made from the tip of the olecranon downwards, over the posterior aspect of the ulna, similar to the lower part of the incision for excision of the elbow-joint. The soft parts

were cleared away for a small space from the posterior surface of the fragment, and a hole drilled through to the broken surface, avoiding the articular cartilage; through this a stout silver wire was passed from the outside, inwards. The tissues were then in a like manner separated from the ulna, and another hole drilled in the same way, except that from the angle made by the two surfaces. The direction of this one had to be made more obliquely than the first; and in this I was more fortunate than Sir Joseph Lister was in the case he describes, and of which he gives a wood-cut in the *British Medical Journal* for November 3rd, 1883, therefore there was no need for me to adopt the very ingenious manœuvre carried out by him with the needle and gouge.

The joint, of which the articular cartilage, especially that covering the surface of the humerus, was plainly visible, was cleared of blood clot and *débris* from the drilling the bone; another wire was passed through this from without inwards, and the end of it between the two fragments of bone was passed through a loop formed at the internal end of the first wire, by which it was pulled out through the first hole. The two pieces of bone then being well pressed together, the two ends of the wire were drawn tight, twisted together, cut off, bent and hammered down on to and partially into the bone. A drainage tube having been inserted, the wound was stitched up and dressed with the protective and gauze in the usual manner.

The same afternoon, at 4.30, some two or three hours afterwards, he said he was in a great deal of pain, but not so much as before the operation. Temperature rose that evening to 99°.4, pulse 84.

November 30th, the next day, the wound on being dressed looked very well; there was only a small amount

of discharge. The drainage tube was shortened; he felt fairly comfortable; considerably less pain than before the operation.

Temperature in the morning, 99°; evening, 99°.8, being the highest point reached, pulse 76.

December 1st.—Dressed wound, which looked remarkably well; there was a discharge of about three drachms of serum; drainage tube shortened again. Slept well, took his food well, and felt comfortable.

December 2nd.—Dressed wound, discharge about one drachm serum; all drainage removed; slight passive movement of the joint made on that day; temperature normal.

December 4th.—Wound dressed; all united, except at the part where the drainage tube had been; removed the stitches; very little discharge.

December 5th.—The wound was again dressed to-day, because he said he felt as if the discharge were running down his arm, which was hanging down, being on a straight splint; but on removing the dressings there was scarcely any discharge, the skin was well united, and the drainage tube cavity filled up. There was some slight tenderness behind the internal condyle, but this was relieved on altering the dressing, and was, I believe, caused by the bandage having been rather tight above the elbow.

From this time he went on steadily improving, passive movements being made frequently. The arm was put on an outside iron splint, hinged at the elbow, which he was allowed to remove and bandage on again after the first ten days.

At the end of the fourth week he could bend the joint to a right angle; at six weeks he was shown at the January meeting of the Bristol Medico-Chirurgical Society, when it was seen that most of the movements of the elbow

were almost perfect. He could extend it until almost straight, bend it to less than a right angle, could touch his head and could pronate and supinate, and seven weeks after the operation he resumed his work as a cab-driver.

I do not for a moment mean to advocate this heroic treatment in every case of fractured olecranon, for the last which came under my care made a very good recovery with bony union, but in that the fragment was smaller, and was easily brought into perfect apposition with the rest of the ulna. The arm, of course being extended, was put up in a gum bandage, which was rendered perfectly rigid by long strips of tin, about ¾in. wide, being placed between the layers of the bandage. Nevertheless, he had not all the movements of his arm restored in six weeks. However, I do feel pretty strongly that if this method is to be adopted at all, it is very much better to do it as soon as possible after the accident, and not to wait until the fragment has been partly absorbed, when, of course, the two surfaces will not correspond; and, in fact, it may be necessary to remove still more of the bone in order to get an adhesive surface, to say nothing of the obstructions to the restoration of the joint by the possible organisation of blood clot, &c., within it, together with any adhesions that may have taken place.

Although primary wiring of the olecranon has never yet been advocated, it was so evident in this case that bony union was almost if not quite impossible that I determined to wire it at once, and think the result has quite borne out the propriety of that determination.

Of course, I should not feel justified in risking such a grave condition as a compound fracture into an important joint if I were not certain that the most perfect antiseptic precautions would be taken; but my mind was rendered

perfectly easy on that score, and I feel deeply indebted to our house surgeon, Mr. Penny, for the very careful and successful way in which he superintended the dressings of this as well as many more of my cases after operation.

The temperature, as shown by the chart, is typical of an aseptic operation. There was slight elevation on the day of and the one following the operation, rising to a max. of about 100 Fah., in this case 99°.8, which is probably the result of nervous disturbance. This quickly subsided to a normal, or taking 98°.4 as the normal to a slightly sub-normal temperature.

In order to avoid any chance of splitting the bone, I used an ordinary Archimedean drill to bore the holes, but as it is difficult to fix the fragment while both hands are employed in working the drill, I think an ordinary bradawl, as used by Professor Lister, would be a better instrument for that purpose.

In the next case I should instead of the first wire pass a loop of rather finer wire, and through it pass the end of the second wire, because in making the loop at the end of the first, on retracting it there was a tendency for the turned-up end to hitch.

CASE OF DEATH FROM FAT EMBOLISM AFTER BONE-SETTING.

By ARTHUR W. PRICHARD, Surgeon to the Bristol Royal Infirmary.

I THINK the following case may be of interest and warning in showing a great danger that may attend any forcible movement of an ankylosed joint, especially if that joint has suffered from chronic inflammation and has for the most part been treated by rest. The unfortunate ending of the

case was death in a few hours, and this result was directly due to bone-setting, by which I mean forcibly moving under chloroform a stiff joint. Not more force was used in this instance than was necessary, I think not as much as is usual; yet an injury was inflicted on the articular ends of bones owing to their being softened and wasted by being kept in splints too long, and this injury caused the death of the patient.

Prima facie the case looks like one of opium poisoning, and until the microscopic examination of the lungs and kidneys, all who saw the patient, I believe, attributed death to this cause. The credit of suggesting fatty embolism as the cause of death is due to Mr. Greig Smith, and on examination of the lungs and kidneys it was demonstrated that his suggestion was correct, both these organs being full of emboli of particles of fat.

The case is as follows:—C. P., aged 18, a fat girl, was admitted under me at the Bristol Royal Infirmary a year ago suffering from chronic synovitis of the knee. She had had pain and swelling in it for three years, and had been lying in bed nearly all that time. On admission the whole limb was thickened and stiff. She could not bear the slightest attempt at bending the knee, and any movement of the limb gave her pain in the ankle, knee and hip. There was no albumen in the urine. I examined her under chloroform and found the hip quite free, but the knee joint stiffened and in fairly good position. I did not attempt to move it, but put her on a McIntyre splint and tried the effect of Scott's dressing and counter-irritants. After the examination she had increased pain, and for some time had a draught every night of 40 drops of liq. morphiæ hydrochloratis, which on some occasions was doubled without producing any bad effect. After three

months, as there was no marked improvement, she was sent for a while into the country.

She was re-admitted in the June of the present year, and was much in the same state as when she went out. I again tried various plans of treatment, such as slight manipulation, followed by strapping, elevation, Scott's dressing and iodine, but no improvement ensued. As everything tried had been of no avail, after consultation with my colleagues, I agreed that movement of the joint under chloroform might possibly do something for her.

Accordingly, on Sept. 14, at 1.30 p.m. she was put under the influence of chloroform and ether, and I examined the limb. There was tolerably firm ankylosis of the knee and stiffness of the ankle. I took hold of the femur with my left hand, and the tibia about its middle with my right, and tried to bend the knee, but as the adhesions did not give way after using some force, I put my left arm under the popliteal space and slowly flexed the joint over it. I felt some bands in the joint give way with that peculiarly unpleasant sensation that attends the breaking down of adhesions in or around a joint, and then after a little more flexion a firmer structure gave way, which enabled the lower part of the leg to move freely. I had not exercised much force, but the free lateral mobility that followed made me afraid that I had separated the epiphysis of the tibia—which turned out to be the case. The limb was bandaged from the toes, and the patient carried back to bed, the leg being kept still by sand bags. The girl had been under chloroform a very few minutes, and came round in the usual time afterwards. There was no vomiting.

In the afternoon she complained of severe pain in the knee and leg, and at five o'clock was seen by the House Surgeon and ordered 40 drops of liq. morphiæ.

At 8.30 the patient was still complaining; she had had no relief from the morphia and was very restless. The limb was examined and found to be much congested, the foot being cold. The posterior tibial artery could be felt pulsating. The bandage was removed, hot bottles placed in the bed, and 20 drops more of liq. morphiæ given.

Two hours afterwards she was still in severe pain; there had been no sleep; the foot was blue and cold, the rest of the body being normal in colour. The pupils were not contracted. 20 drops more morphia were ordered.

At 1 a.m., two and a half hours after the last dose of morphia, she was sitting up in bed complaining bitterly of the pain. She had had no relief from it at all since the operation, and 20 drops more were given. A quarter of an hour afterwards she went to sleep, and the night nurse, who did not leave the ward, noticed her to be sleeping quietly and not making any noise in breathing.

At 2 o'clock she was visited and seen to be lying quietly asleep.

At 3 the pillows were moved and the patient turned over in bed, but did not wake up; there was no blueness of the face, and she slept quietly till about 5. At 5 her sleep was observed to be heavy, and the house surgeon saw her at once. There was then considerable cyanosis of the face and of the affected limb; the pupils were much contracted, and the conjunctivæ insensible. The patient could not be roused. The breathing was rapid and deep, and moist sounds were to be heard all over the chest; a little frothy mucus was coming from the mouth, and the pulse was small, quick, and regular.

She was at once transferred to a private ward and the stomach pump was used, the stomach being washed freely out. Strong coffee was administered and forced move-

ment employed, the patient being rolled about in bed. Cold affusion and flagellation were tried, as well as galvanism and artificial respiration. This treatment was continued for some hours, and twice a hypodermic injection of one-thirtieth of a grain of atropine given. The rapidity of the respiration kept up, her breathing being shallow, but as many as 30 in the minute. There were mucous râles all over the chest. The urine was drawn off and found to contain about one-fourth albumen, and the patient gradually sank and died about one p.m., nearly twenty-four hours after the operation. Just before death there was considerable twitching of the arms, and the pupils dilated widely, but she never regained consciousness.

The post-mortem examination took place next day, and to the naked eye no sufficient disease in the internal organs was found to account for death. The lungs were hyperæmic, and it was fancied that the blood which escaped on their section was greasy to the touch, and the kidneys were congested, the capsule being somewhat adherent, the cortical portion diminished, and there was a cyst in one. The knee-joint on being laid open was seen to be full of thin blood; there was a recently broken adhesion between the internal condyle and the inner tuberosity of the tibia, and the cartilage was gone from a part of the internal condyle, leaving the bone exposed and rough for three-fourths of a square inch. The compact layer of the whole of the lower end of the femur was exceedingly thin, and so soft as to take the imprint of the nail easily. It was indented at one part, and on section with the knife the cancellated structure in the vicinity of the dent on the internal condyle was filled with fat and dark blood, the outer condyle or section presenting cancellous structure filled with yellowish marrow. The

tuberosities of the tibia were also soft, and the tibia was fractured through its upper epiphysis. The popliteal and femoral arteries and veins, the common iliac vein and the vena cava were examined and found healthy.

Fatty embolism was now suggested as being the cause of death, and the lungs and kidneys were subsequently examined by Dr. Fenton Evans and Mr. Greig Smith, and it was found that both organs presented in every part well marked blocking of the capillaries by fat globules.

We therefore concluded that fat embolism combined with morphia was the cause of this patient's death. Morphia, in the amount that was given, would probably not have caused it alone. She had five-sixths of a grain in divided doses between five in the afternoon and one o'clock next morning, and until the last twenty drops were given she had had no sleep; and this was the same patient who had on previous occasions taken two-thirds gr. in two doses in a much shorter time, without bad effect. Further, the greater the pain the more opium a patient can bear with impunity, and the pain that this girl suffered after the operation was apparently far more than ever she had had before. Also, there was one symptom before death that showed that death was not due to morphia poisoning alone, namely—the rapidity of breathing that was kept up till she sank. This made us look for some other cause, and I think that there is no doubt but that fatty embolism was the chief cause of death.

It is easy to see how this embolism might arise. The veins from the cancellous part of the articular ends of a long bone emerge by numerous large apertures in the compact layer, and having support from bone have very thin walls, and are held open if torn across. Some of these vessels in this case, on account of the weakened bone

being unable to resist the pressure applied during manipulation were broken, and a communication was opened up between the cancelli, filled with fluid marrow, and the veins. Blood flowed freely into the cancellated structure, as was proved by the ecchymosed condition the condyle was in when cut open, and fluid marrow probably escaped by the veins and was circulated generally through the system.

If such be the explanation, it is remarkable that the accident does not more frequently occur in ordinary fractures, and I think it is likely that it does happen more often than the few records of fatty embolism would lead us to believe; death ensuing soon after a fracture is put down to shock perhaps too often. Further, is it not possible that the condition of fatty embolism may occur, yet the patient recover? In such a case the symptoms would be masked, and the danger of the constitutional disturbance that follows any serious injury to bones increased. Fatty embolism in such a case, causing perhaps hyperæmia and œdema of the lungs, would be rendered much more dangerous to life by the administration of opium to the patient, for this would increase the difficulty that they had to contend with by retarding the respiratory movements, and yet the condition a patient is in immediately after a fracture is more commonly treated by that drug than by any other.

Should a case of fatty embolism be diagnosed, I venture to suggest that ether, either inhaled or swallowed, would be the rational treatment; it would be beneficial as a stimulant, perhaps dissolve or more finely divide the fat in the vessels, and help its elimination by the kidneys.

In conclusion, fracture, or, if I may so call it, laceration of soft bone is not an uncommon accident to those

who promiscuously work over-rested joints about, and I think that the occurrence of fatty embolism is a possibility to be remembered; and if more attention were called to this cause of death, in fractures, osteomyelitis, and other diseases and injuries of the bones, more cases of it might be recorded.

CASE OF DIPHTHERIA TREATED BY TRACHEOTOMY, PEPTONISED ENEMATA AND IODOFORM.

By R. SHINGLETON SMITH, M.D., M.R.C.P., Physician to the Bristol Royal Infirmary.

THE following case of recovery after Tracheotomy for Laryngeal Diphtheria is worthy of short record.

Florence H., æt. 6, admitted Dec. 26th, 1883, in state of asphyxia, with abundant exudation visible in throat. Tracheotomy was performed immediately, and gave marked and immediate relief.

Dec. 27.—Temperature was 102°, urine had one-eighth albumen, and there was much swelling of cervical glands.

Dec. 30.—The edges of the wound were gaping, stitches had sloughed out, and glands very much swollen.

Dec. 31.—Milk taken in by mouth at once came out through the tracheal tube and gave rise to much choking cough. Nutrient enemata of peptonised milk, and Slinger's capsules were given; all food by the mouth discontinued.

Jany. 4.—The child was wasting rapidly, although the temperature was normal, and threatened pneumonia had cleared up. The enemata not being well retained peptonised milk was injected into the stomach through an œsophageal tube, but was only partially retained. The tube in trachea was then removed; the sloughing of

wound had ceased, the swelling of glands subsided. In a few days the child could swallow solid food, although liquids would still pass down the larynx. The wound in the neck gradually healed, the opening in trachea closed, power of deglutition both of solids and liquids returned. The child rapidly improved in strength; speech returned in about a month, and the urine was free from albumen six weeks after admission.

The only essential element of treatment, other than by tracheotomy, peptonised enemata and œsophageal injections, was iodoform. This was given in grain doses with mucilage every four hours during the first five days, till the power to swallow was lost. Iodoform was also painted on the fauces, and diffused in vapour throughout the air of the steam-bed. It was also applied to the wound and over the tube in the form of iodoform wool.

Notes on Books.

The General Practitioner's Guide to Diseases and Injuries of the Eye and Eyelids. By L. H. TOSSWILL, M.B., Pp. 147. London: J. & A. CHURCHILL, 1884.

The tendency of many authors of late years has been simply to condense or abridge the material contained in large standard works, and to bring out the result of their labours with such titles as "Guide," "Elements," "First Steps," &c.

This method has advantages for the student, no doubt; but only when it is not carried too far. When the curtailment is so great as to cause the omission of large portions of the subject there are grave objections to the plan. The author of the small work before us says in the preface that "brevity" has been his aim, so that busy practitioners, who have not time to read "more comprehensive" works, may yet be able to turn to his in the hour of need. Most men in active practice do not, however, read text-books—large or small—systematically through, but use their library for *reference* only; and for this purpose a work which embraces the whole of a subject, and not merely a fragment of it, is requisite. All the information contained in this book can readily be found, certainly in not too diffuse a form, in any of the smaller standard works, *e.g.*, those of Macnamara, Lawson, or Nettleship. The possession of this work alone would not satisfy a man with any love of his profession: he would want a more complete treatise.

Speaking generally we can say that the book is in a very readable form, and that the teaching is sound so far as it goes; but there is evidence of want of care in revision. Slight grammatical errors appear here and there, and expressions whose meaning is somewhat obscure. What are we to understand by the last part of the following sentence? "Hot belladonna or poppy fomentations are required in almost all cases of suppurative iritis, in the other varieties of iritis when attended with unusual pain, and in all except severe cases of atropism." Again, after enumerating other

causes of hypopyon, the author goes on to say—"Lastly, hypopyon may be due to iritis, irrespective of suppurative inflammation."

We are told in another place that eserine should be used in suppurative corneitis only when "there seems to be no probability of iritis." Doubtless quite right in theory; but who is to decide in such cases when there is likely to be immunity from this complication?

Recourse to a specialist is frequently and rightly advised when certain operations are necessary; but are we to think that "epilation" is a manipulation requiring a specialist's skill? Yet this means of relief in cases of entropion and trichiasis is not even mentioned in the short paragraph devoted to these affections. Saemisch's operation is spoken of in two or three places. If it is necessary to mention it at all in such a work, why not say what it is, since this might be done in a very few words?

A description of the group of subjective symptoms, which should lead the practitioner to suspect the presence of "errors of refraction," ought certainly to have been inserted in any work, even when of such limited scope as this one. The estimation of such errors can, of course, only be satisfactorily accomplished by a specialist; but the practitioner should nevertheless have his earnest attention drawn to the subject, if not for the sake of his own reputation, then certainly for the benefit of his patients, many of whom would thus be spared the infliction of gallons of medicine, for intractable headaches, &c., when suitable glasses would at once effect a cure.

Medical Fashions in the nineteenth century; including a sketch of Bacterio-mania and the battle of the Bacilli. By E. T. TIBBITS, M.D. Lond. London: H. K. LEWIS, 1884.

Following Dr. Hare's example, Dr. Tibbits has written a booklet upon the mutability of medical fashion—fashions both of theory and of practice. In the course of some seventy pages he firstly touches briefly upon a variety of topics, such as bleeding, mercury, the employment of remedies in excessive and in minute doses, alcohol, anæsthetics and so forth, while the latter half of the book is occupied with his views upon

the germ theory of disease, or what he is pleased to call bacterio-mania, and the battle of the bacilli.

It is not so stated, but we presume that the text is that of an address to a local society afterwards amplified sufficiently to make a small book. It would be uncharitable to suppose that a physician of Dr. Tibbits' position would, under any other circumstances, put into circulation a work so flimsy in substance and so slip-shod in composition. Instead, therefore, of submitting the book to a formal review, we will let the author express his views upon one or two topics in his own words, as being the fairest method of showing the quality of the information he affords us.

Speaking of anæsthetics, he says:—"Reference may be made to the comparatively recent use of anæsthetics during childbirth. . . . to produce a kind of intoxication and sometimes complete insensibility. Whether I am right or not I cannot help thinking that the invariable use of an anæsthetic in this manner is a most pernicious custom for many reasons."

Speaking of the physiological action of digitalis, he says:—"I believe that the so-called arterial tension supposed to be brought about by the action of digitalis has frequently been simple distension of the blood-vessel, *i.e.*, relaxation (?) of its muscular coat, plus diminished frequency of cardiac pulsations. The 'increased arterial tension,' said to be produced by digitalis, was regarded as a phenomenon of a tonic nature, and finally this drug was classed with stimulants, such as alcohol, ether, ammonia and the like, and in this category it is now placed."

His views on the etiology of typhoid fever are these:—"Insufficient or improper food, exposure to cold, great bodily or mental depression or exhaustion; one or all may in some instances constitute the actual *exciting* cause of a serious attack of typhoid fever."

Lastly, his opinions upon the germ theory of disease may be deduced from this brief sentence:—"That the air contains much organic matter and many individual organisms is beyond the region of dispute, but that such visible organisms have anything whatever to do with disease is pure hypothesis."

Dr. Tibbits' experience with the "wool-sorters' disease," which occurs prominently in Bradford, has led him to take a special interest in bacilli, as the causes or concomitants of diseases like anthrax and tubercle, and nearly half of this

book is occupied with a discussion upon what he terms the battle of the bacilli. Although none would be convinced and few in any degree influenced by his arguments, still this part of the book is written with a more intimate acquaintance with the subject than is relatively displayed in the other sections, and it is at least worth reading.

Dr. Tibbits promises soon another somewhat similar work, called "Mores Medici;" we hope it will help to sustain his reputation by being a contribution to medical literature more solid and more scientific than "Medical Fashions."

Observations on Lithotomy, Lithotrity and the early detection of Stone in the Bladder, with a description of a new method of tapping the Bladder. By REGINALD HARRISON, F.R.C.S. Pp. 71. London: J. & A. CHURCHILL, 1883.

The honestly recorded experience of a practical, painstaking and independent surgeon is always welcome. And the record is doubly welcome when, as in this case, it is made in a simple, straightforward and concise manner, dwelling only on those points which the author considers noteworthy or has made specially his own, and passing over others which are well established and generally understood.

In the operation of lithotomy the author tells us that he adheres as closely as possible to the lines laid down by Cheselden, and gives additional short directions as to how to meet the chief difficulties which may arise. He introduces a tube into the bladder after the operation, as it prevents obstruction by clots to the free flow of the urine, and keeps the patient drier and more comfortable. When the perineum is deep, or the prostate large, he has found the cutting gorget of service.

The most important portion of the work relates to lithotrity and the revolution recently introduced in its methods by Professor Bigelow. We infer that Mr. Harrison considers that rapid lithotrity has removed from the domain of lithotomy stones of almost any size, not only in the adult and in moderately old people, but also in children of not too tender an age, where the stones are under half-an-inch in the longest diameter. It has been said that we do not want a

better operation than lithotomy for children; but if a stone three-eights of an inch in diameter can be removed by lithotrity from a child, and the patient sent home well in a week, we must conclude that a better operation has been found. May lithotrity and rapid evacuation of the fragments by aspiration not be expected year by year to be applied to children of increasingly tender years? If so, and if stones are detected earlier, we fear that the grand old operation of lithotomy will ere long be a rare one in surgery.

The work concludes with a description of a method of tapping the bladder through an enlarged prostrate by means of a new trocar and canula, to which a rubber tube is attached. The method has had good results in his hands and promises to be useful.

On Bedside Urine Testing: including quantitative albumen and sugar. Pp. 128. By GEO. OLIVER, M.D. Second edition. London: H. K. LEWIS. 1844.

This work is descriptive of what is essentially a new mode of urine testing, viz., by test papers. The reagents are deposited in a concentrated and readily soluble state in some chemically inert porous material such as filtering paper, and produce their effects by being re-dissolved in the urine. The most delicate tests were found to be potassic-mercuric-iodide, picric acid, and sodium tungstate. A sufficiently trustworthy and apparently easy method for the quantitative estimation of sugar and albumen is described.

Dr. Clifford's methods promise well, and should they prove trustworthy will no doubt be extensively used. His experiments have been well selected, and are carefully recorded; while the directions for the use of his tests are clear, concise and accurate. We heartily recommend the work to the perusal of our readers.

A Synoptical Guide to the Study of Obstetrics. By ROBERT BARNES, M.D. Pp. 122. London: SMITH, ELDER & Co. 1884.

These notes are evidently the work of a scientific man thoroughly conversant with his subject. Though the work is little more than the skeleton notes which a lecturer would

use, and so would be specially favoured by the student attending lectures or preparing for examination, yet their scope is so wide and their arrangement and classification so scientific and methodic that the practitioner wishing to test his knowledge or refresh his memory would find it most useful. To those who are fond of writing small books on great subjects we would commend this one of Dr. Barnes as a pattern to copy.

A Short Manual for Monthly Nurses. By C. J. CULLINGWORTH, M.D. Pp. 79. London: J. AND A. CHURCHILL.

This is another small book, but it is on a small subject, or at least it appeals to readers whose intellects are supposed to be limited. Nevertheless it is a good little work, well put together, clearly written, and, what is a frequent failing in works of this sort, quite free of the theoretical and the purely scientific side of obstetrics. There is here nearly everything that a monthly nurse need know; and, what is almost of equal importance, nothing that she ought not to know.

The Asclepiad. A quarterly Journal. Vol. I, No I., pp. 96. By BENJAMIN WARD RICHARDSON, M.D., F.R.S. CADE AND CAULFIELD. London: January 1884.

Under this high sounding title Dr. Richardson, as editor and sole contributor, presents us with the first number of a new quarterly. We are not quite sure whether the name of "asclepiad" is intended to suggest a relation with the priestly followers of the god of medicine himself or is only intended to uphold the doctrines of the well-known Roman physician Asclepiades, who was such a successful preacher of the little-flesh-no-wine-much-exercise rule of living. If we might draw conclusions from the nature of the contents of the work before us we should suppose the latter. Rome in the days of Asclepiades was in many respects similar to London in the days of Richardson. Let us hope that the modern teacher may be as successful as the old one was.

Dr. Richardson's writings in this journal are of a piece with his more recent productions generally, and belong to that doubtful borderland between grave medicine and light literature which a worried practitioner finds most comfortable reading in the arm-chair after dinner. It is easily understood, moderately true, somewhat novel, and not overcrowded with statistics and facts. We feel when we have laid it down that if we have learnt little we have whiled away a pleasant hour in a legitimate manner, free from the torment of lethal germs and the travails of German pathology.

We like Dr. Richardson's journal. The author is one of the few men in our profession who can write the language of a cultured Englishman, and this alone ought to commend his work to our readers. "Felicity as a sanitary research" is the subject of one of his articles, and if his efforts do not add to our happiness they do not—as the efforts of most of our scribbling confreres do—add to our miseries; and this is a good deal to say in favour of any part of the medical language and literature of the present day. We wish the venture every success, and hope that Dr. Richardson may live to give us many such volumes.

Price Current and Notes on New Remedies. FERRIS & CO., Bristol.

Our enterprising fellow-townsmen have sent us a large closely-printed quarto volume of 130 pages, containing a full list of all their medicines, instruments and specialities, with a full posological table and extensive notes on new drugs. The notes on recently introduced remedies, extending to nearly fifty pages, are carefully compiled from current periodicals, and present in convenient and readily accessible form all the reliable information which the practitioner needs to guide him in prescribing them.

Medical Extracts.

A New Treatment of Cancer.

Not long ago Professor Nussbaum treated a case of cancer of the mamma, with so strong a tendency to hemorrhage that each dressing of the ulcer threatened the woman's life. As the patient was nearly moribund from the frequent loss of blood, he surrounded the tumour with a strong subcutaneous ligature, which he drew together with all his strength and then tied. The result was not only an arrest of the hemorrhage and a speedy rally of the patient, but a constant decrease of the tumour to one-quarter of its size, when the ulcer began to cicatrize. He now proposes to prevent the feeding of these tumors by their peripheral nutrient vessels in the manner indicated. The blood which supplies the tumor through its base, while it does not absolutely starve it, is, however, sufficient to keep it stationary. In order to accomplish the desired interruption of the blood supply from the periphery, he urges the formation of a furrow around the tumor down to the fascia, about one centimetre wide, made by means of a thermo-cautery.—*The Therapeutic Gazette*, Dec., 1883.

The late Dr. J. Marion Sims.

At the last meeting of the Newport (R.I.) Medical Society Dr. Samuel W. Francis, Vice-President, presented the following resolutions, which were adopted :—

Whereas, It has pleased Almighty God to remove from this earth Dr. J. Marion Sims; therefore

Resolved, That, in his death, Science has lost a star; Surgery a pioneer; Gynecology an originator; America one of her philanthropists; and the fair sex their best friend.

Resolved, That the name of J. Marion Sims will live till woman dies.

Resolved, That the boldness of his operations was only equalled by his tenderness and sympathy at the bedside.

Resolved, That, as he belonged to the world, both hemispheres will mourn his loss and cherish his memory.

Resolved, That a copy of these resolutions be transmitted to the family.

The Beef Tea Fallacy.

From time immemorial beef tea has been one of the standard beverages and nutriments of the sick room, and were its history fully written, we have little doubt that it would show a great mortality attending its use. By filling the stomach to distension it is capable of allaying hunger,

while the patient may be literally starving, and doubtless many a fatal case of disease of an adynamic type is ascribable to the fallacious food with which it has been sought to support the vital powers, rather than to the disease itself.

Look at the meat after the beef tea has been prepared from it. The bulk of the solids of the meat is myosin, which is the substance we intend to pay for when we buy butcher's meat; the substance we mean to feed upon when we eat the beef steak. After the preparation of beef tea this myosin is thrown away, a little the worse for its treatment, a little tough, insipid, deprived of its salts, yet containing all the strength of the meat. The tea has removed from it no nutritious substance, excepting only the mineral salts. Four fluid ounces of beef tea were dried in a water bath, not quite perfectly, in order to avoid any possible destruction and hence loss, but rather to allow the error to tell in favour of the beef tea. The residue weighed 51 grains, that is, four fluid ounces of beef tea contained 51 grains of solid matter.

Professor Baumgarten's experiments are the most convincing with which we have been favoured for some time, of the fact of the almost absolute uselessness of beef tea and the various extracts and essences of beef which are largely sold, and which the people, and too large a proportion of the profession, are made to believe to be foods or substances capable of sustaining life and repairing waste of tissue. Beef tea and the various extracts and essences referred to, are useful only in so far as they stimulate appetite and facilitate the digestion of such food as may be given in connection with them. This is their only legitimate function, and when they are depended upon to the exclusion of true food, the result is only disaster to the confiding patient.—*Loc. Cit.*, Oct., 1883.

Antiseptic Sugar Dressings for Wounds.

Dr. Fischer reports in the *Centralblatt für Chiurgie* for August 25, 1883, that he and Professor Lücke have used this application in several instances with satisfactory results. They have used a mixture containing equal parts of sugar and napthaline, and one of iodoform one part to sugar five parts. The mixture is rubbed into gauze, which is applied over the line of suture, or, where there is a loss of integument, the sugar is strewn directly upon the tissues. Sugar cushions were prepared and used in the same way as peat or sublimate sand cushions. The dressings may be left *in situ* for eight or ten days. The secretions are diffused equally throughout the mass of sugar, except when the layer is too thick it sometimes becomes lumpy. There was never any bad odor about the dressings, even when they had been on a long time. Granu-

lation proceeded finely under the sugar; there was no bleeding, and cicatrization was quickly accomplished.

Extirpation of the Lung.

Dr. Domenico Biond has removed one entire lung fifty-seven different times in animals (sheep, dogs, cats, etc.), of which number thirty survived. In five instances, in which only portions of one or both lungs were extirpated, the animals all recovered. The failure, in the thirty cases of death, the experimenter attributed in great part to the neglect of proper antiseptic precautions.—*L'Union Médicale*, September 2, 1883.

On the Intra-Venous Injection of Saline Solutions as a substitute for transfusion of Blood.

The use of saline injections in Asiatic cholera in the early part of this century demonstrated the safety of such a procedure, and likewise its inefficiency in checking the career of that disease. Within a few years, however, this method has risen to the level of a life-saving measure, as a substitute for the transfusion of blood in conditions of acute anæmia and collapse. Of nineteen patients who have been subjected to the operation, when at the point of death, thirteen have entirely recovered; in three death was averted, but occurred later; and in the remainder only a temporary improvement was effected. [A table of the cases is given.]

Dr. Jennings recommends this solution: chloride of sodium, 50 grs.; chloride of potassium, 3 grs.; sulphate of soda, 2.5 grs.; carbonate of soda, 2.5 grs.; phosphate of soda (Na_3Po_4) 2 grs.; dissolved in twenty ounces of water at 100° F., with the addition of 2 drachms of absolute alcohol, to be injected by means of a siphon of rubber tubing or a brass syringe.

The salts are kept in a small phial. A trocar and also a blunt stylet are added, in order that one may puncture the vein with the former, or after opening it guide the canula into it on the latter instrument. An ordinary glass or metallic irrigator, or a funnel with tubing attached will do about as well. Let the solution (water, ʒ xxxij.; chloride of sodium, ʒ jss.; carbonate of soda, gr. xv.), warmed to 100° F., flow from a height of two or three feet in the course of fifteen or twenty minutes. The canula should be no larger than a medium-sized aspirator needle, one-sixteenth inch in diameter; the apparatus disinfected with three per cent. solution of carbolic acid and antiseptic precautions observed in operating. Choose the arm in which a well-distended vein can be seen at the bend of the elbow, and failing to find one secure the radial artery, and inject the fluid into its central end.—*N. Y. Med. Record*, January 5th, 1884.